Another new development using

B. F. Goodrich Chemical *raw materials*

Hycar helps diesels make the right connections

Control jumper manufactured by Pyle-National Co., Chicago, Ill. B. F. Goodrich Chemical Company supplies the Hycar rubber only.

THIS "juice" connector for diesel locomotive units lives a rough life—but a good and long one, thanks to Hycar rubber!

The connector, or electrical control jumper, consists of a 250-volt multi-conductor cable and two plug heads molded in Hycar. These are vulcanized together to form a one-piece unit—may have as many as 27 circuits. It carries vital power for the train . . . rides the rails under all kinds of tough conditions.

It must withstand oils, chemicals, and extreme temperature changes. It must resist the damaging effects of coal dust, salt water spray and greases. When disconnected and carried from one diesel to another, the heavy jumper is sometimes dragged along the road bed—an extra beating that it takes in stride.

Taking all that punishment—and more—is Hycar's job. For Hycar rubber can be made to resist heat and cold . . . water, weather and wear . . . gas, oil, many chemicals and more damaging conditions.

Designers and molders find Hycar rubber compounds help improve or develop many products. They may be just what you need. We'll gladly help you, with technical bulletins and advice. Just write Department HA-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. In Canada: Kitchener, Ontario. Cable address: Goodchemco.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
Reg. U.S. Pat. Off.
American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors

For happy days use **Philblack* A**

Easy processing . . . all the way!

● "Nervy" rubber compounds getting on *your* nerves? Consult your Philblack technical sales representative. See how easy it is to cure processing headaches (and cure rubber compounds!) with Philblack A.

This easy-going black penetrates GR-S and reclaimed rubber particles . . . *fast!* Presto! You get really homogeneous, uniform mixtures with remarkably good extrusion qualities.

Try Philblack A wherever you need smooth, glossy surfaces, truly accurate moldings, pliancy, suppleness and general good looks! Depend on Philblack A also to reduce heat build-up in heavy duty tires and tubes. Philblack A is shipped in bags or bulk . . . for use in natural, synthetic or cold rubber.

PHILLIPS CHEMICAL COMPANY

PHILBLACK SALES DIVISION

EVANS BUILDING • AKRON 8, OHIO

PHILBLACK EXPORT SALES DIVISION • 80 BROADWAY • NEW YORK 5, N. Y.

* A Trademark

Philblack A and Philblack O are manufactured at Borger, Texas. Warehouses in Akron, Boston, Chicago and Trenton.
West Coast agent: Harwick Standard Chemical Company, Los Angeles. Canadian agent: H. L. Blachford, Ltd., Montreal and Toronto.

the plant's enlarged—the product improved

for users of PLIOVIC

USE PROVED Products

EVERY user of vinyl resin can gain from the triple expansion of the plant you see here—source of Goodyear's use-proved vinyl resin, PLIOVIC.

As a result of this expansion in size and improvement in equipment, you can now count on all the PLIOVIC you want—no strings attached. And PLIOVIC now gives users all these advantages: higher resin uniformity; easier processing; lower moisture content; improved thermal stability, bulking and water absorption.

If you produce molded or extruded vinyl items—use organosols, plastisols or latex dispersions—calender, spread or cast—look to PLIOVIC for help to better product quality.

Write today for sample and full information to:

Goodyear, Chemical Division
Akron 16, Ohio

This modern triply-enlarged PLIOVIC *plant assures improved raw material and improved final products to* PLIOVIC *users.*

Pliovic—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

GOODYEAR

THE FINEST CHEMICALS FOR INDUSTRY

beauty treatment by TITANOX pigments

From baby's "BATHINETTE" to big sister's boots, rubber and plastic products get a real "face lifting" from Titanox titanium dioxide pigments. Whiter whites and brighter tints make your product better looking than ever, more appealing to today's color-conscious buyers.

Yet, for all their value, Titanox beauty treatments are easy on your production costs. Titanox pigments' fine particle size makes them readily dispersible in both rubber and plastic compositions, regardless of the equipment you use. They are physically and chemically stable, uninfluenced either by the heat or the ingredients used in compounding elastomers or plastics. In short, Titanox pigments are highly compatible with both.

There's a rutile or anatase type Titanox pigment for any of your requirements, for low or heavy loadings, for any degree of whiteness or opacity, for indoor or outdoor end use. Just check with our Technical Service Department—they'll be glad to help you. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; Boston 6; Chicago 3; Cleveland 15; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 9, Ore.; San Francisco 7. In Canada: Canadian Titanium Pigments Limited, Montreal 2; Toronto 1.

9745

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the brightest name in pigments

TITANIUM PIGMENT CORPORATION

Subsidiary of NATIONAL LEAD COMPANY

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Kralastic Latices give

Longer Life – Lasting Appearance – More Strength

for papers, textiles, carpets, felt, and all fibrous materials

Used with conventional equipment for coating, spraying, or saturating, Kralastic latices give:

- dry, tack-free surfaces
- better gloss
- greater strength and tear resistance
- grease and oil resistance
- resistance to solvents
- dependable flexibility

Get in touch with Naugatuck Chemical for the special latices you need, expertly compounded to meet your exacting requirements.

We cover the waterfront with a complete line of water-based materials

Lotol*—Compounded latices, ready to use

Kralastic*—Flexible plastic latices

Kralac*—Plastic latices, for paints, paper, textiles and for further compounding

Nitrex*—Butadiene acrylonitrile copolymer latex

Latex—Natural and synthentic

Naugatex*—Dispersed chemical compounding ingredients for all latices

Dispersite*—Aqueous dispersion of rubber, reclaimed rubber or resins

*Reg. U. S. Pat. Off.

Naugatuck Chemical Division of **United States Rubber Company**

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BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • New York • Philadelphia • Memphis

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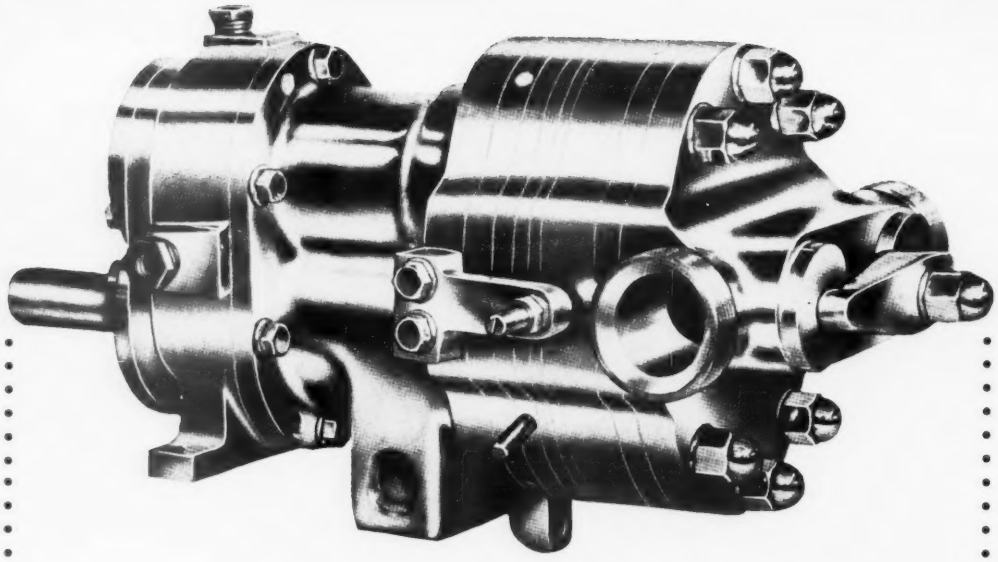

FLOW-MASTER

is the answer to your

LATEX PUMPING PROBLEM

Flow-Master latex pumps are presently operating, pumping and metering latex twenty-four hours a day without the necessity of disassembling for many days.

Pumping and metering natural, GR-S, Neoprene and other latex compounds no longer presents a problem.

MARCO COMPANY, INC.

3rd & Church Streets Wilmington, Del.

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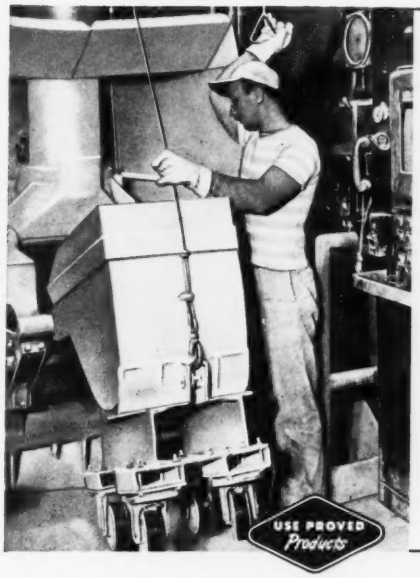
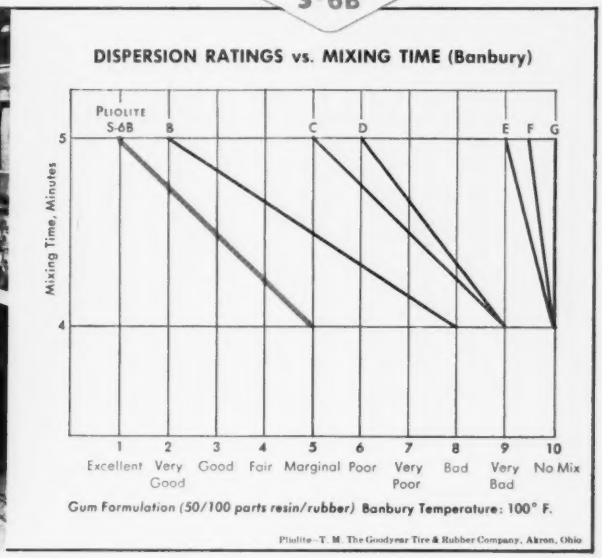
MORE PRODUCTION FROM SAME BANBURY

with PLIOLITE S-6B





TESTED against six competitive rubber reinforcing resins, Goodyear's PLIOLITE S-6B gave higher Banbury production in obtaining marginal to excellent dispersions.

Reason for this increase is the superior ease of dispersion possible with PLIOLITE S-6B – and resultant easier mixing, faster mixing and consequent increased production capacity from existing equipment.

PLIOLITE S-6B added to rubber stocks gives you other benefits too – increased hardness, increased stiffness, increased flex-life, increased abrasion resistance, increased tear resistance.

Preferred 6-to-1 over other resins by rubber compounders, PLIOLITE S-6B has become "The Best Known–Known as the Best" among rubber reinforcing resins. See a Chemical Division Representative for details, or write:

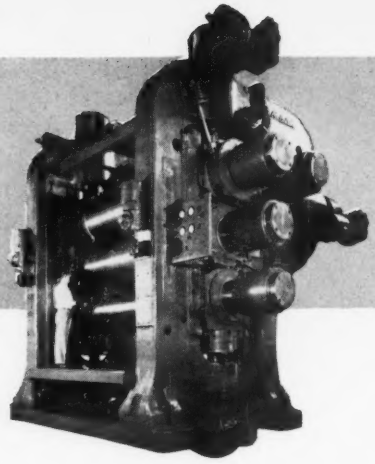
Goodyear, Chemical Division
Akron 16, Ohio

GOODYEAR

THE FINEST CHEMICALS FOR INDUSTRY

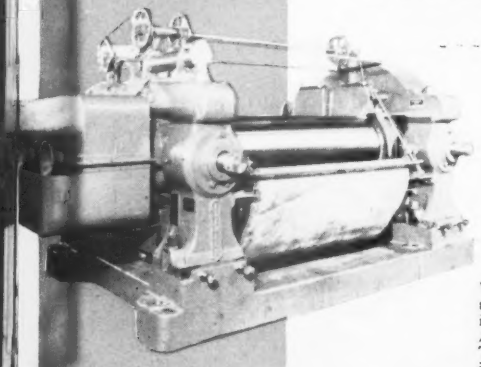
CALENDERS

We make all types and sizes of Calenders, precision designed for extremely close tolerances to meet the most exacting requirements in the production of plastics film or the coating of fabrics with rubber or plastics. The unit shown is an ADAMSON UNITED 32" x 92", 4-Roll Plastics Calender geared to produce 72" wide vinyl film, 2 mils. or less in thickness at speeds to 150 YPM.



RUBBER and PLASTICS —

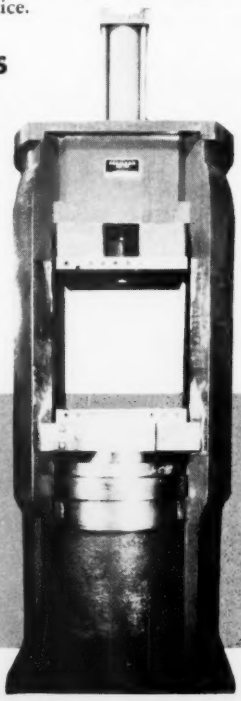
... designed and built by...



We engineer and build all types of individual production units and complete electronically controlled trains with all accessories for every Rubber or Plastics processing requirement. Our highly specialized engineering and production facilities plus the combined research and technical abilities of United Engineering and Foundry Company, and the manufacturing capacity of eight modern plants, are at your service.

PRESSES

We build all types of presses for the rubber, plastics and plywood industries. Shown is a new 24" ADAMSON UNITED BARREL TYPE PRESS with transfer cylinder. This new press, an exclusive ADAMSON UNITED development, exerts up to 76% more platen pressure than conventional types without change in present hydraulic lines. Stock is transferred into the mold cavities through sprues which reduces cure time and flash trimming to a minimum. Sizes range from 12" through 32" with larger sizes available to specification. Presses Catalog No. 462 on request.

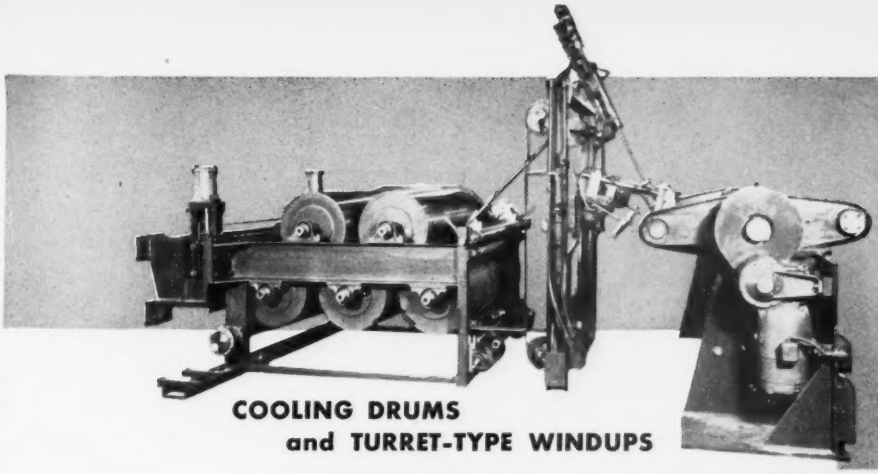


MILLS

An 84" Individual Mill equipped with a mixing apron. ADAMSON UNITED Mills may be had in all sizes from 6" x 16" to 28" x 84", driven individually; in pairs with right angle reducer between the units, or grouped on a line shaft with reducer at one end of the shaft. Apron, as shown, can be installed on any type of existing mill. New catalog No. 463 on request.

AUTOCLAVES or VULCANIZERS

Built to specific requirements from 18 inches to 15 feet in diameter, any length, vertical or horizontal to withstand internal pressures as high as 1000 lbs.-per-square-inch. The Pot Heater shown is a vertical, cylinder-operated Breech-door type. Write for Vulcanizer Catalog No. 461.



COOLING DRUMS and TURRET-TYPE WINDUPS

This is a standard type of accessory equipment arrangement for plastics film. It consists of embossing equipment; cooling unit; slitting devices; compensator stand and automatic turret windup. The turret windup stand is a center-drive-type with automatic indexing equipment, yardage counter, and adjustable tension control. We design and build entire calendering process systems including all accessory equipment.

— PRODUCTION UNITS

..... ADAMSON UNITED

BRAKE and TIRE TESTING MACHINES

Installation shows an 84" Adamson United High-Speed Jet Airplane Brake and Tire Testing Machine of the inertia type. We have built similar machines as large as 16 feet in diameter for speeds up to 250 M.P.H. and tire loads to 150,000 pounds.

Wire, phone or write us today. No obligation.

ADAMSON UNITED COMPANY

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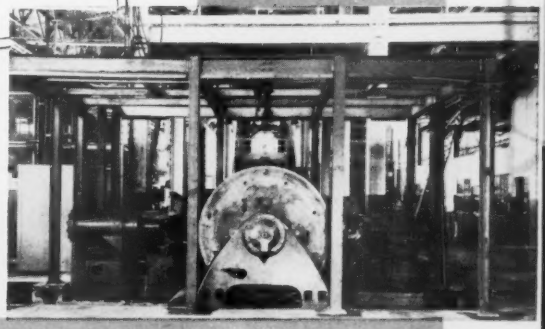
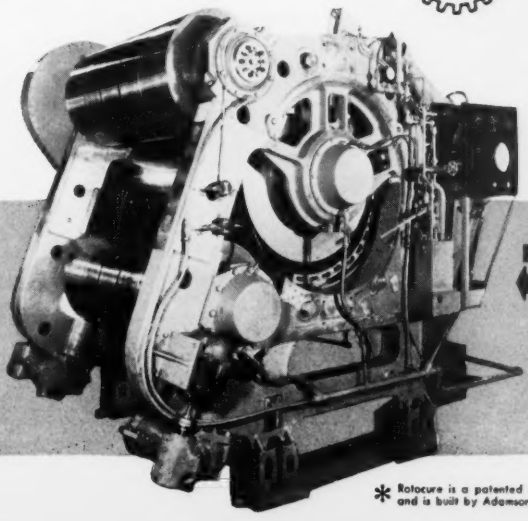
SALES OFFICES IN PRINCIPAL CITIES

Subsidiary of United Engineering and Foundry Company





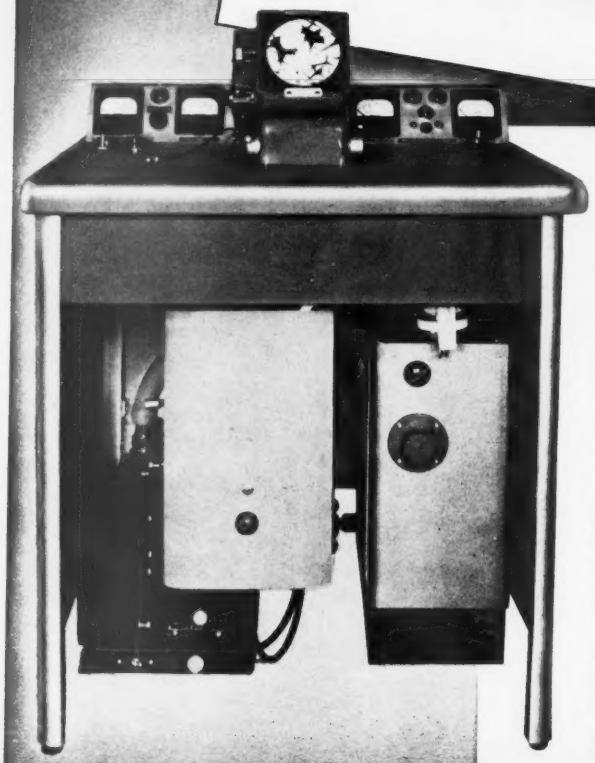
ROTOCURE*

A new machine for the continuous curing of all flat rubber or plastics articles with smooth or designed surfaces. Rotocure increases production through continuous operation without opening, cooling, reheating and closing. It eliminates overcuring or undercuring of the over-lap areas occurring on conventional presses. Roll and belt changes, incident to design requirements, can be made on this new 60" x80" Rotocure in one-tenth the time formerly required.

* Rotocure is a patented development of Boston Woven Hose and Rubber Co. and is built by Adamson United Co. under a licensing arrangement.

Announcing

FARRAND ELECTROSTATIC ELECTRON MICROSCOPE



FEATURES

Resolving power 30 au — freedom from astigmatism — ease of alignment — distortionless image at all magnifications — consistent high image quality at direct magnifications up to 20,000X.

The image of the specimen does not rotate with changes of magnification; this is of particular importance in stereo studies. The electrical center in electrostatic lenses coincides with the geometrical center, therefore, alignment is simplified.

Electron gun is of high intensity and efficiency — filaments are easily and quickly replaceable — adjustment for pinhole position and beam alignment can be made during instrument operation — specimen holder permits manipulation in three translational motions.

Power supply is small, compact and easy to service — output voltage is variable making operation possible over a wide range without change of focus.

Large area viewing screen—built-in camera arrangement without air lock — specimen holder permits rapid change and setting of specimen.

Adaptable for electron diffraction techniques — stereo electron micrographs.

Bulletin 807 Sent Upon Request

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... a line of top quality chemicals for rubber processing...the products of years of research which has established—and maintained—Calco leadership.

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Thiazole
- MBT (Mercaptobenzothiazole)
- MBT-XXX (Specially Refined—Odorless)
- MBTS (Benzothiazyldisulfide)
- NOBS* No. 1

Guanidine
- DPG (Diphenylguanidine)
- DOTG (Diorthotolylguanidine)
- Accelerator 49

Calco®

ANTIOXIDANT

Antioxidant 2246*

(Non-staining, non-discoloring type)

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Pepton® 22 Plasticizer

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Calco Retarder PD

*Trade-mark

STIFFENING AGENT

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SULFUR

Rubber Maker's Grade

AMERICAN *Cyanamid* COMPANY

CALCO CHEMICAL DIVISION
INTERMEDIATE AND
RUBBER CHEMICALS DEPARTMENT
BOUND BROOK, NEW JERSEY

SALES REPRESENTATIVES AND WAREHOUSE STOCKS:
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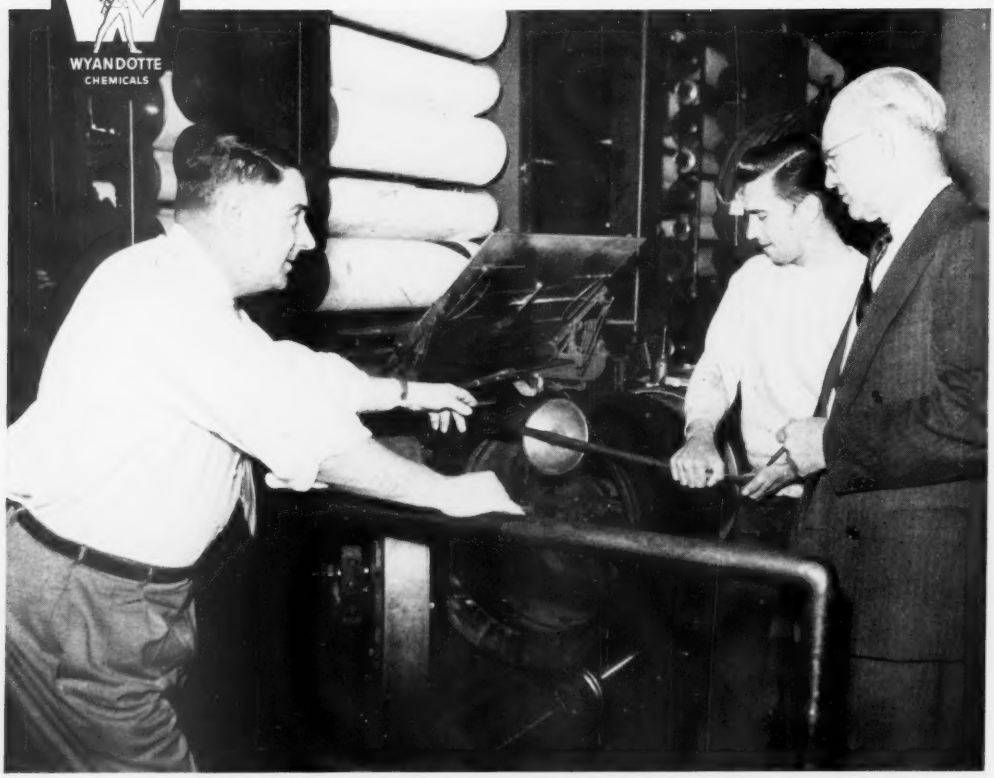
H. M. Royal, Inc., Los Angeles, Calif. • H. M. Royal, Inc., Trenton, N. J. • In Canada: St. Lawrence Chemical Company, Ltd., Montreal and Toronto

WYANDOTTE
CHEMICALS

Purecal—a GR-S and dollar-saver



William M. Moser (left) and Ed Hillendahl, Pacific Tire and Rubber Company executives, inspect GR-S carcass stock containing Wyandotte PURECAL.

"Wyandotte Purecal T improves over-all quality in GR-S tire stocks"

—William M. Moser, *Development Mgr.*

Pacific Tire and Rubber Company executive tells how this Wyandotte product gives higher tear resistance and good cord adhesion in GR-S carcass stocks:

"We demand the highest quality in our products," says Mr. William M. Moser, development manager. "A great deal of our research and development work is devoted to continual improvement of quality and maintenance of high standards.

"Our tests and subsequent experience, using Wyandotte PURECAL* T in GR-S carcass stock as a reinforcing filler, have shown PURECAL to be an exceptionally fine aid to quality. With it in our carcass stock, we get higher tear resistance, good cord adhesion between plies, excellent building tack, and improved quality of GR-S stock.

"Using PURECAL in our processing, we can run 100% GR-S stock on our 4-roll calender without the necessity of regrinding the rolls."

PURECAL is becoming an increasingly important ingredient in the manufacture of a wide range of rubber products, including tires, wire insulation, fire hose, and industrial belts. For technical assistance, samples, or a free copy of "PURECAL in GR-S," write to *Wyandotte Chemicals Corporation, Wyandotte, Michigan, or phone AVenue 2-4300, Wyandotte. Offices in Principal Cities.*

* TRADEMARK

Wyandotte
CHEMICALS

MT. VERNON FABRICS

MT. VERNON FABRICS
Give You Greater Fabric Uniformity

Shown is one of a series of comprehensive laboratory controls throughout production to assure uniformity in all Mt. Vernon-Woodberry products. Here evenness of sliver is being checked with linear regularity tester.

Mt. Vernon-Woodberry Mills

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Selling Agents
40 WORTH ST NEW YORK

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Route 9 Starts in Southeast Asia

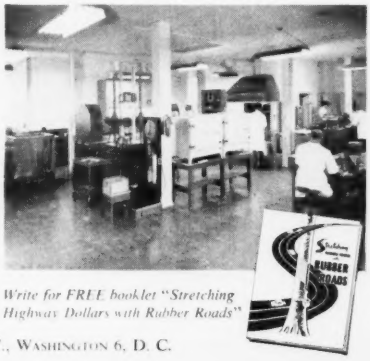
America's highways of the future may be paved with natural rubber from Southeast Asia. Today, test strips of natural rubber asphalt roads have been laid in seventeen states, the District of Columbia and several provinces in Canada. Rubber, added to the road surface, promises to make highways wear longer, hold their shape in winter and summer, and reduce skidding. This is good news for the motorist — as well as the taxpayer trying to save money on road upkeep. On such new uses for natural rubber depend the well-being of millions of people in Southeast Asia, where 95% of the world's natural rubber is grown. The United States is the world's largest rubber user. This tie between East and West means much in the struggle by free nations against Red aggression.

← RESEARCH IN THE EAST

At the Rubber Research Institute of Malaya studies are made of the natural rubber powder used in rubber roads. This powder, mixed with the asphalt, promises to give a tougher, more resilient and longer wearing highway surface.

RESEARCH IN THE WEST →

New rubber road research laboratory, opened by the Natural Rubber Bureau in Rosslyn, Virginia, and working closely with U. S. highway engineers, will do research on how to build better highways at less cost using rubber asphalt top surfacing.



Write for FREE booklet "Stretching Highway Dollars with Rubber Roads"

Natural Rubber Bureau 1631 K Street, N. W., Washington 6, D. C.

White walls are back

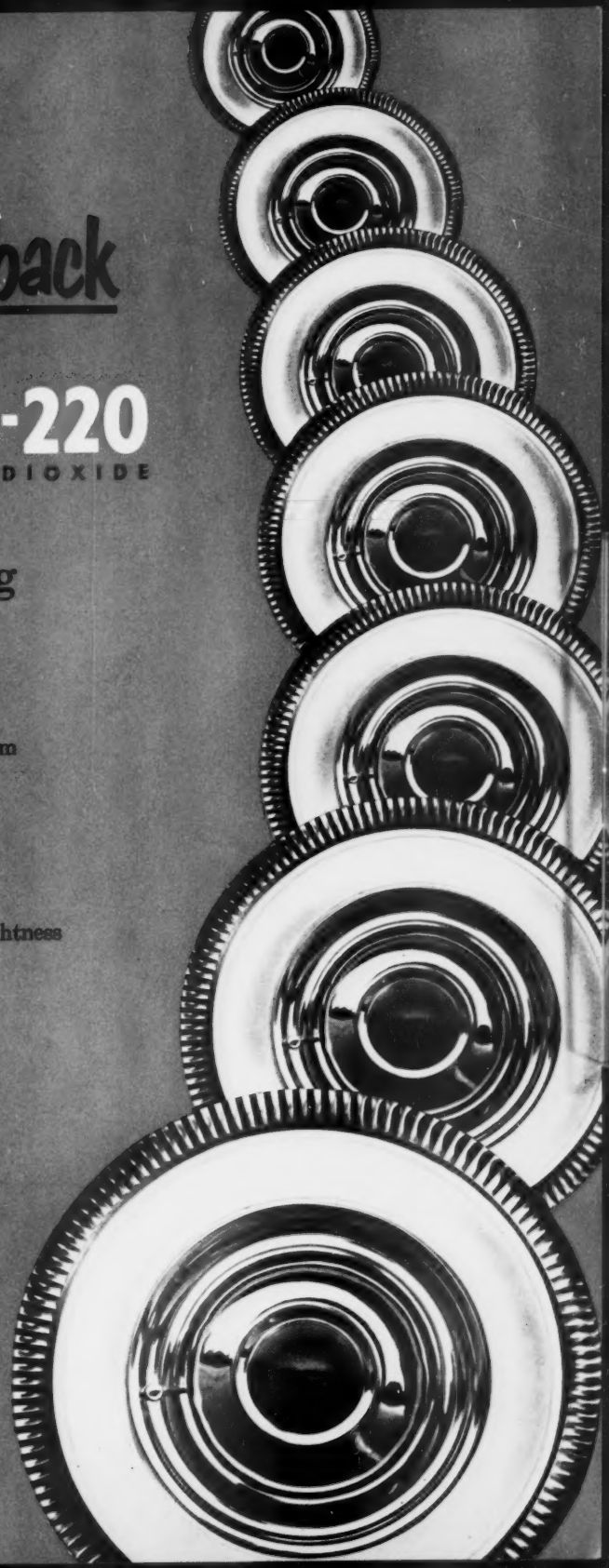
and UNITANE® 0-220
TITANIUM DIOXIDE

is available for maximum whitening at minimum cost

You secure maximum whitening with minimum loading—and minimum cost—in your rubber products with UNITANE O-220.

Specify it for brilliance in white and tinted articles. And—it gives that clean, snappy brightness to white side-wall stock.

Your Calco representative will gladly advise you on the grade of UNITANE best suited to your needs.



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AMERICAN Cyanamid COMPANY
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AQUEOUS SUSPENSIONS OF ULTRA ACCELERATORS,
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50% Zinc Dimethyldithiocarbamate

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50% Zinc Diethyldithiocarbamate

VULCACURE ZB
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PARTICLE SIZE EQUIVALENT
TO FORTY-EIGHT HOUR BALL MILLED DISPERSIONS

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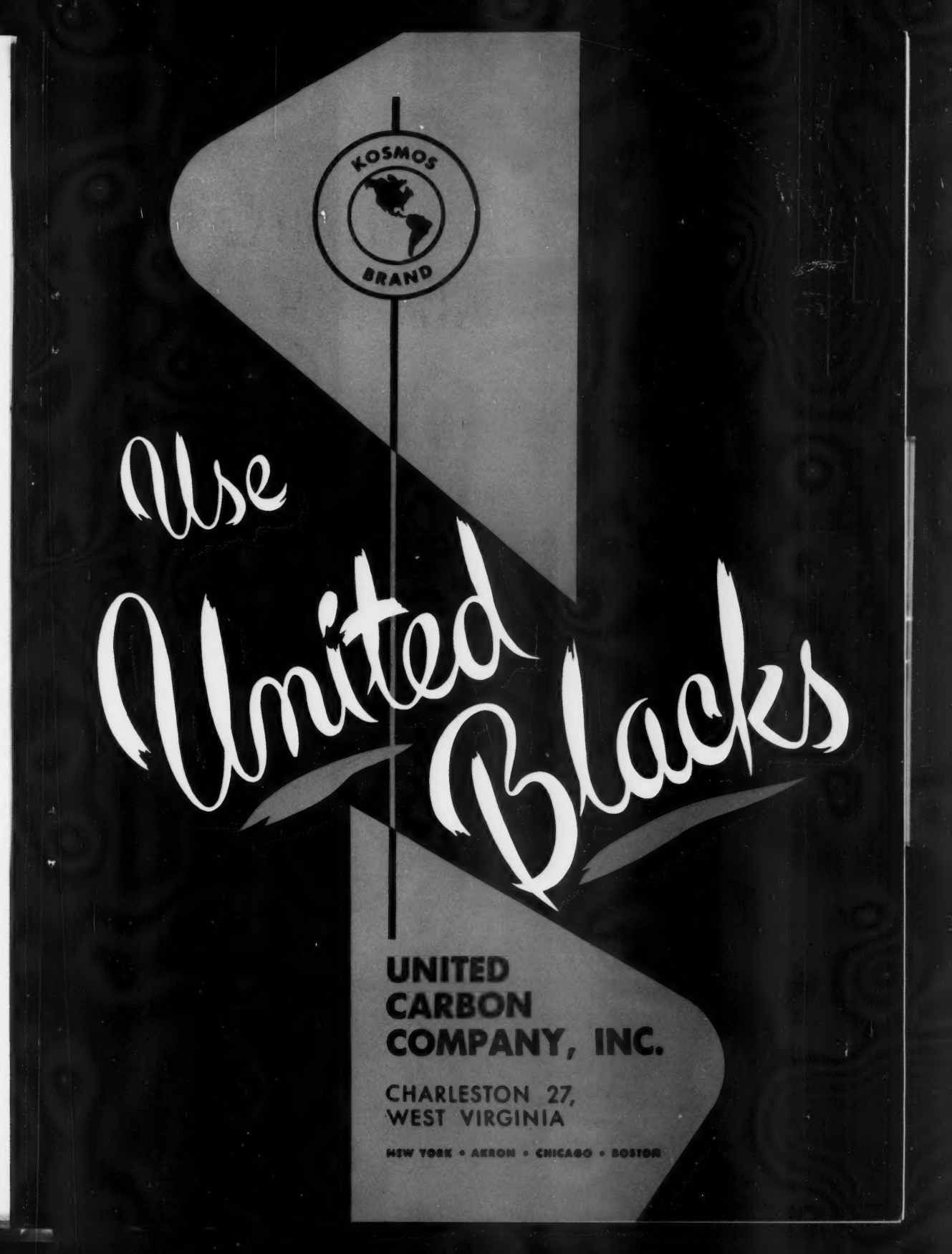
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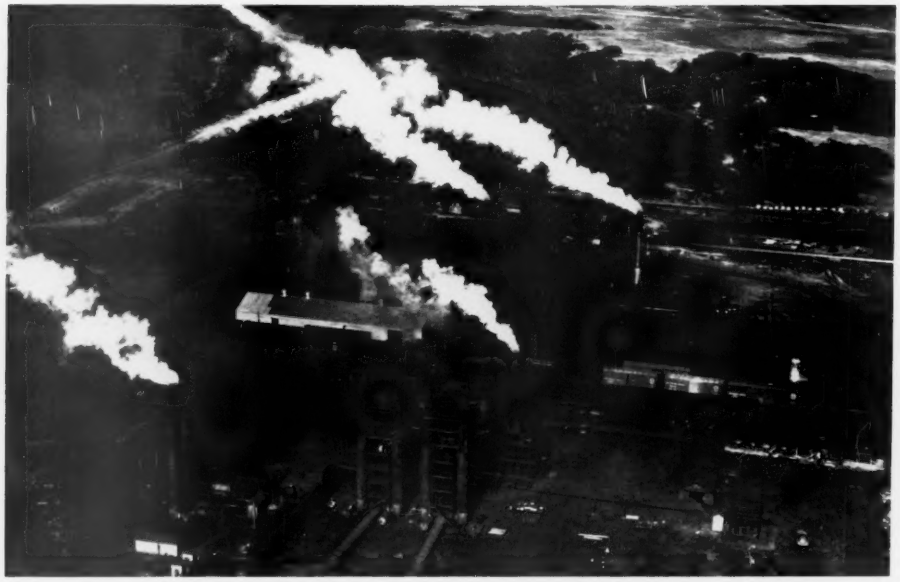

AERIAL VIEW OF THE COMPANY'S CARBON BLACK FURNACE PROCESS PLANTS AT ARANSAS PASS, TEXAS

KOSMOS 50

Kosmos 50, a quality furnace black (FEF) with superb processing characteristics and outstanding reinforcement, is continuously being used by discerning compounders with gratifying results in a variety of stocks.

There are no problems with United Blacks.

UNITED CARBON COMPANY, INC.

CHARLESTON 27, W. VA.

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CANADA: CANADIAN INDUSTRIES, LIMITED

When Every Minute Counts...

You Can Count On DAVIS-STANDARD EXTRUDERS

For a new high peak in production, achieved in less time and at lowest cost, you can depend on these rugged work horses of the rubber industry.

Designed and built by men who understand the production man's needs and problems, Davis-Standard extruders have many features which overcome old disadvantages or add totally new production benefits.

Every functional part is engineered for the utmost in rugged simplicity and for sustained high output. Base for extruder and motor is fabricated steel plate, to permit the ultimate in design variation. Drive from variable speed motor is either V-belt or flexible coupling to an enclosed worm reduction gear drive. For long run operation the drive housing is equipped with a large cooling coil. Feed and gap section has large jacket for cooling or heating. All machines are equipped for screw temperature control. Heads are the exclusive high-velocity Davis-Standard "Stream-Flo" type, in straight or side delivery variations.

It will pay you to write for detailed specifications and list of plants using Davis-Standard extruders with great satisfaction.

We believe our equipment has exceptional benefits to offer, because of our experience gained as the world's largest makers of custom-built extruding machines.

Our engineers will cooperate with yours to solve your production problems

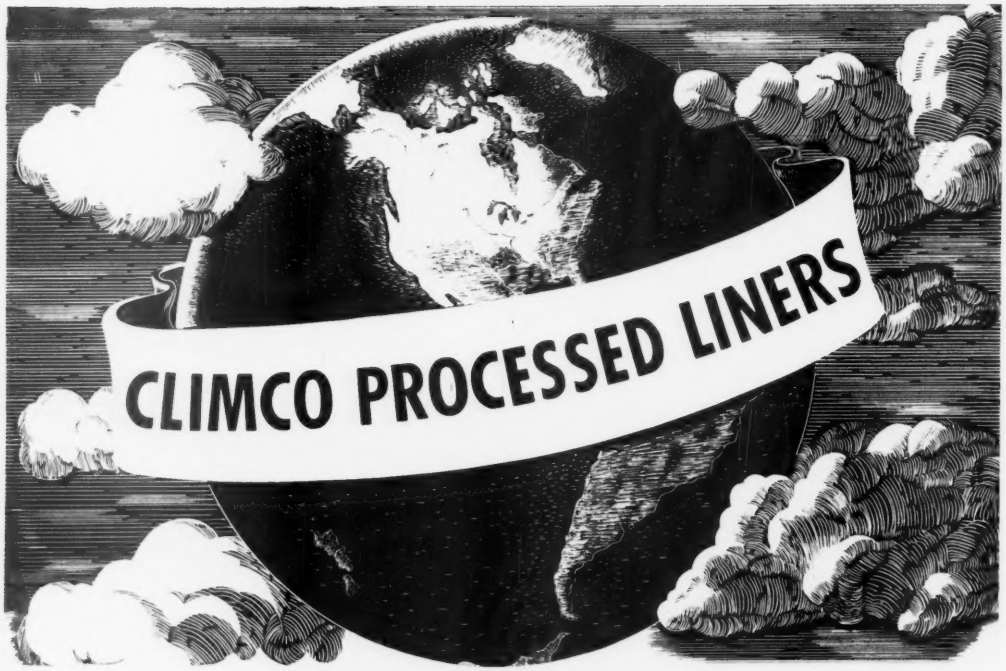
THE STANDARD MACHINERY COMPANY

18 WATER STREET MYSTIC, CONN.

MOLDING PRESSES AND EXTRUSION MACHINES

World's Largest Manufacturers of Custom-Built Extrusion Machines

Export Office: Ballagh & Thrall, Independence Square, Philadelphia 6, Pa.



have world-wide acceptance

On every foreign continent, *just as in the U. S. A.*, Climco Liners are speeding production by ending stock adhesions. For Climco Processing insures perfect separation of stock and liner—saving time and reducing expensive stock losses.

Climco Processed Liners also increase the life of your liners and preserve the tackiness of the stock. They also enlarge latitude in compounding, eliminate lint and ravelings and facilitate horizontal storage.

Let us tell you how Climco Processed Liners have proved their worth all over the globe. Better yet, give them a trial.

ILLUSTRATED LINER BOOKLET

Tells all about Climco Liners and Linerette and how to get better service from liners. Write for your copy now.

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West Coast Representative:—MERIT WESTERN CO.
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PROCESSED LINERS
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HAVE you seen the newest pieces of vinyl plastic luggage for women? They won't stain, chip or crack and they'll outwear and outlast natural materials. Some cases, like the smart looking ladies' gladstone at left, are made of heavy, unsupported vinyl sheeting. They have a flexibility that allows them to take years of punishment without showing it.

You can thank the *plasticizer* for that important property. And you can be doubly sure of good flexibility and permanence if the plasticizer is one of the broad family of quality-controlled Pittsburgh PX Plasticizers.

As a basic and integrated producer of coal chemicals we have the important advantage of being able to control the quality and uniformity of Pittsburgh Plasticizers from coal to finished product. And *you* benefit by consistent plasticizer performance . . . improved characteristics in your finished plastic products . . . and by dependable, continuing supplies. ● We'll be glad to send you samples and specification sheets or provide you with any technical assistance you may need. *Write today!*

PX-104	DiButyl Phthalate
PX-108	DiIsoOctyl Phthalate
PX-138	DiOctyl Phthalate
PX-208	DiIsoOctyl Adipate
PX-238	DiOctyl Adipate
PX-404	DiButyl Sebacate
PX-408	DiIsoOctyl Sebacate
PX-438	DiOctyl Sebacate
PX-658	TetraHydroFurfuryl Oleate
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WBD 4161

PLASTICIZER DIVISION

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BRC 30 Rubber Compounding Pitch
BRV Rubber Softener*
BRT 3 Rubber Reclaiming Tar*
BRT 4 Rubber Reclaiming Tar
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DOW CORNING mold lubricants keep molds CLEAN

. . . cut mold maintenance costs by as much as 80%

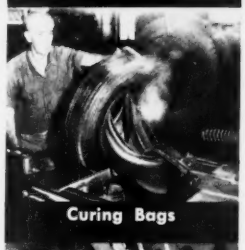
You'll find cobwebs on the blow torch and the buffing wheel; rust on the wire brushes and the drills in mold cleaning departments where Dow Corning silicone mold lubricants are used to release tires and mechanical rubber goods, heels and soles, floor tile and mats. And there's very little capital tied up and very little storage space wasted on replacement molds.

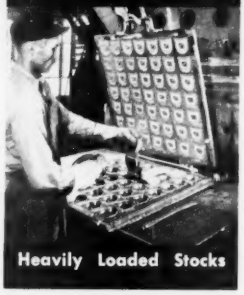
Ask why, so we can tell you again! Our Silicone Mold Release Fluid and Emulsions won't break down to form a hard black scale at any temperature. So, clean molds stay clean 5 to 20 times as long as they ever did before. You don't have to spend any of your hard earned money to hire somebody to wear your molds away with frequent cleaning.

And you get easy release of parts with a high surface finish, sharp detail, close tolerances; parts that will sell at a price that doesn't have to cover a lot of needless scrap, lost production time and mold maintenance costs.

For lower costs specify DOW CORNING SILICONE RELEASE AGENTS

Deep Cavity Molds


Curing Bags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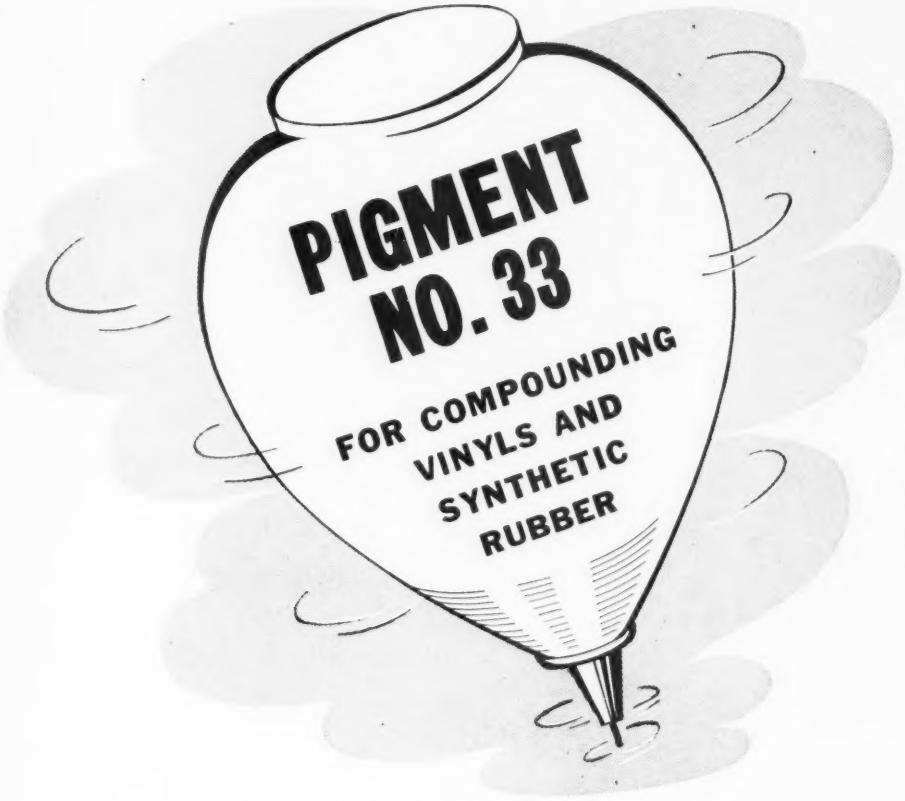
. . . . . *Chemicals for the Rubber Industry*

R 46

IT'S "TOPS"



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FAST DELIVERY because **EEMCO** operates its own modern foundry and machine shop, and has every facility including a large stock of motors, controls and component parts at hand at all times.

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RUBBER AND PLASTICS MACHINERY DIVISION

For WHITE SIDEWALLS that STAY white!

Use "non-staining" U. S. RECLAIM #3013 in your carcass

Here it is Spring and, once again, a young man's fancy can turn to WHITE sidewalls as well as other things. The only trouble is that, as a manufacturer, you have to face up to *higher costs* all along the line. That's when new improved U. S. Reclaims can help you out of plenty of production problems.

For instance, our new "3013" can help you produce a BETTER white sidewall tire at a reasonable cost. As you well know, when ordinary reclaims are used in the carcass of such a tire, a "bleeding" process many times "stains" the white sidewall even before your dealer can sell it. We've licked that bugaboo with "3013" . . . a specially developed reclaim that completely eliminates this nightmare for manufacturers.

In addition, we have good news about one of our *exclusive* DIP-PROCESS reclaims! Recent development work here indicates that our amazing new R-400NS possesses excellent non-staining properties. By the time this magazine gets to press, we will have some REAL NEWS for you. Drop us a line now, for the latest report!

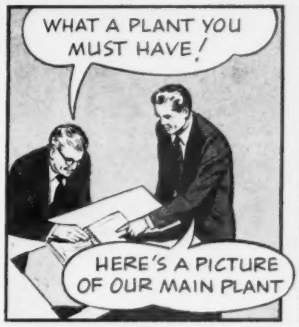
Always keep reclaims in your formula and always look to U. S. for the best. U. S. Rubber Reclaiming Company, Inc., P. O. Box 365, Buffalo 5, N. Y. Trenton agent: H. M. Royal, Inc., 689 Pennington Ave., Trenton, N. J.

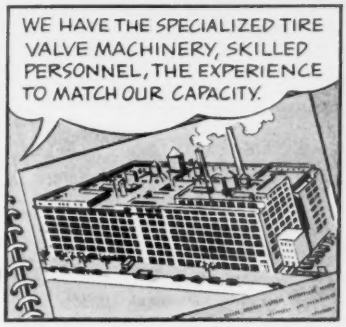
U.S.

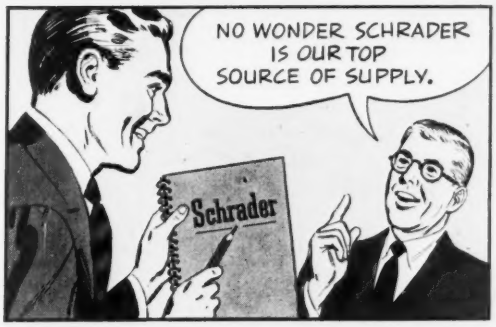
69 years serving the industry solely as reclaimers

RUBBER RECLAIMING COMPANY, INC.

Schrader Contributions to the Tire Industry







Schrader—leading tire valve manufacturer—not only provides a dependable product, but anticipates the industry's needs . . . constantly increasing and modernizing factory equipment and procedures to meet tire manufacturers' delivery requirements with a quality product at the lowest possible cost.

A. SCHRADER'S SON, BROOKLYN 17, N. Y.
Division of Scovill Manufacturing Company, Incorporated

Schrader
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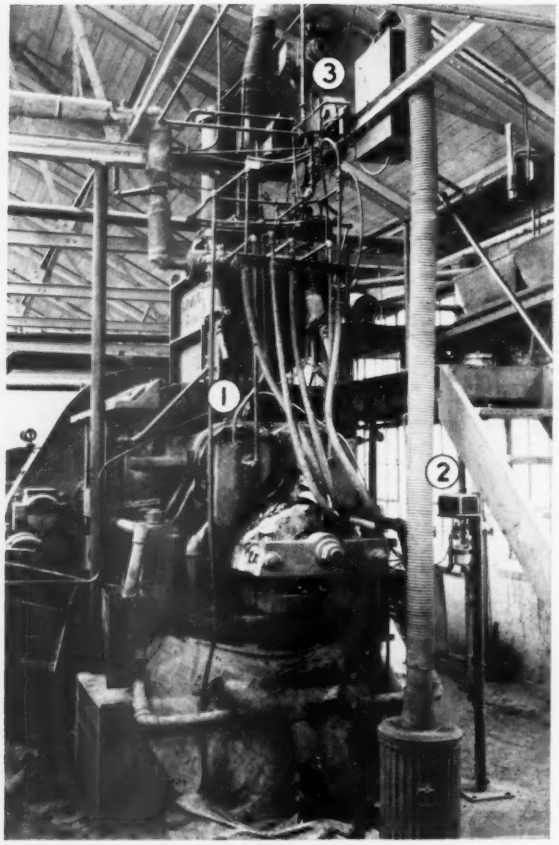
FIRST NAME IN TIRE VALVES
FOR ORIGINAL EQUIPMENT AND REPLACEMENT

How hot is the mix in your Banbury?



Taylor has licked the problem of giving fast, accurate temperature measurements of the tough mix inside your Banbury Mixer. Taylor's TRANSAIRE* Temperature Transmitter practically eliminates time lag in the difficult measurement problem, and is so fast and so precise that it gives an accurate record of both the *temperature and time* of every batch.

This is the fastest temperature measuring system yet satisfactorily applied to Banbury mixers. Its exceptionally quick response is due to a new derivative action, SPEED-ACT*, in the measuring system of the TRANSAIRE force-balance temperature transmitter.

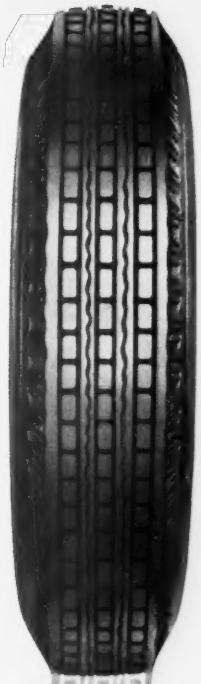
The Cincinnati Rubber Mfg. Company, makers of mechanical rubber goods, has installed the new system on the Banbury shown at left. They are getting records of each batch in the Banbury that are most accurate and an improvement over results previously obtained. Ask your Taylor Field Engineer how you can do the same! Taylor Instrument Companies, Rochester, New York and Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

*Trade-mark

HERE'S HOW IT WORKS: The tiny temperature-sensitive bulb is installed through the wall of the mixer at point 1, about 1½" into the mix just above the rolls. Impulses from the bulb are converted to output air pressure by the Transaire Transmitter at point 2, and relayed to a recorder mounted by the catwalk at point 3. Recorder makes a permanent record of true temperature and *actual time* of each batch.

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY



reduce scorch with SULFASAN R

Monsanto Research has developed Sulfasan R, a sulfur-bearing material which gives great freedom from scorch in compounds such as natural rubber treads loaded with HAF blacks. This is brought about because Sulfasan R, which has good stability at ordinary processing temperatures, breaks down at curing temperatures and liberates sulfur for vulcanization.

Some regular sulfur can be used with Sulfasan R and still maintain freedom from scorch, except under extremely severe processing conditions. Stocks containing Sulfasan R age well. White stocks in which Sulfasan R is used are not discolored.

For further information on Sulfasan R, write or phone MONSANTO CHEMICAL COMPANY, Rubber Chemical Sales, 920 Brown Street, Akron 11, Ohio.

Sulfasan: Reg. U. S. Pat. Off.

A NEW EDITION *of "Monsanto Chemicals for the Rubber Industry" is ready for distribution. If you have not received your copy, write for it. It will be sent without cost or obligation to you.*

SULFASAN R

(4,4'-dithiodimorpholine)

MONSANTO

CHEMICALS — PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

Photo courtesy of Woodall Industries, Inc.

A stitch in metal saves *plenty!*

STITCHING with wire is a relatively new way of joining metal to metal, or metal to almost any other material. Since speeds up to 100 stitches a minute are possible . . . and since wire is economical . . . there are tremendous time-and-cost savings compared with other methods of fabrication.

Success of the whole idea hinges largely on special wire. For the wire must be *stiff* to penetrate metal. It has to be *strong*, up to 330,000 psi in tensile strength, to provide a lasting grip. Still it must be *ductile* to take tight 180° bends without cracking or breaking.

Here, at our Worcester Wire Works Division, this unusual wire is produced in several strengths, sizes and finishes to meet all metal stitching requirements perfectly! Here too, the skill and care for which Worcester Wire Works has long been known result in exceptional uniformity—a particularly great advantage for any user of machine-fed wire.

Do you have a problem involving wire? Perhaps, as in metal stitching, a new, specially developed wire is the answer. Maybe you need only some specialized engineering help on the use or fabrication of wire. In any case, Worcester Wire Works stands ready to serve you, to give you the advantage of engineering experience, special skills and techniques that have been over 30 years in the making. It's your standing invitation to out-of-the-ordinary, personalized service in wire.

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for high quality

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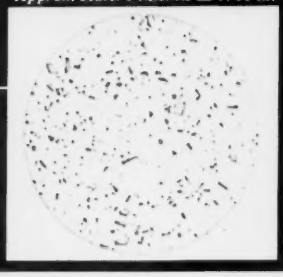
Magnification 1500X
Approx. Scale: 1 Micron = 1/16 in.



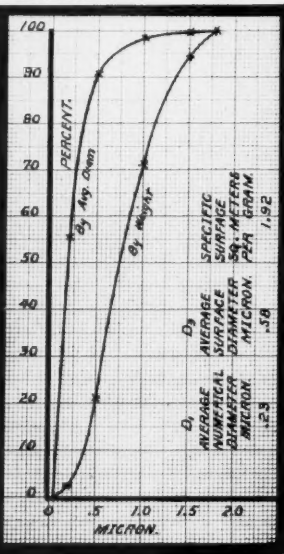
ST. JOE RED LABEL #31

Representative Chemical Tests

ZnO	99.00%
Pb	.03
Cd	.01
Mn	.003
Cu	.002
Acidity as SO_3	.25
Total S as SO_3	.35
H_2O soluble salts	.70
Insoluble in HCl	.15
Loss at 110° C.	.30

Representative Physical Tests

Particle size	
Average numerical diameter D_1 — microns	.23
Average surface diameter D_3—microns	.58
Specific surface—Sq.M./gram	1.92
Percent fines under .50 micron	21.0
Specific gravity	5.65
Apparent density—lb./cu. ft.	25.
Cleanliness	
Percent thru 325 mesh screen	99.97



Particle Size Distribution

Another member of the family of St. Joe Rubber Grade zinc oxides, **Red Label #31** is widely used in synthetic and natural rubber compounds where long, flat cures and good scorch resistance are necessary. And in common with all St. Joe zinc oxides, it is characterized by excellent activating and reinforcing properties.

Complete physical and chemical properties of St. Joe rubber grade zinc oxides are described in our new technical manual, ST. JOE ZINC OXIDES. Write for your free copy—on your company letterhead please.

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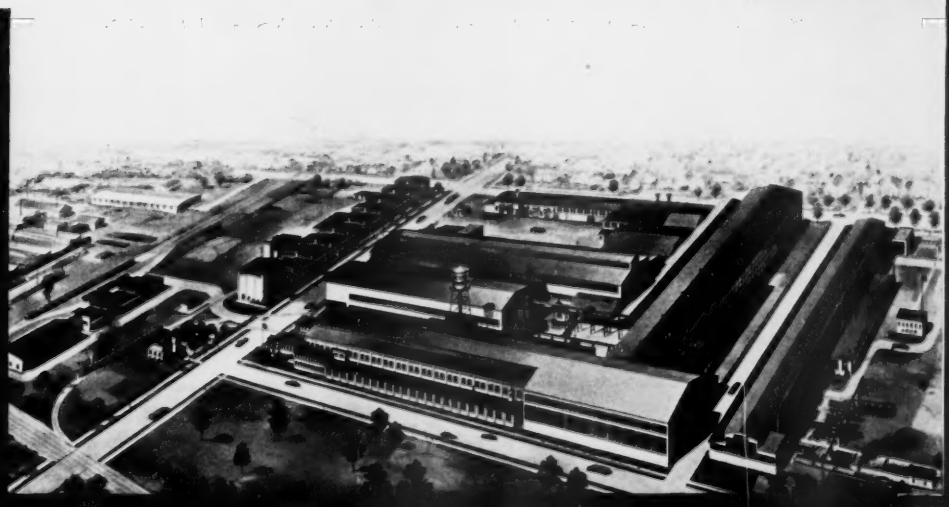

Shop facilities of our associates, the Aetna-Standard Engineering Company at Warren, Ohio and Ellwood City, Pennsylvania.

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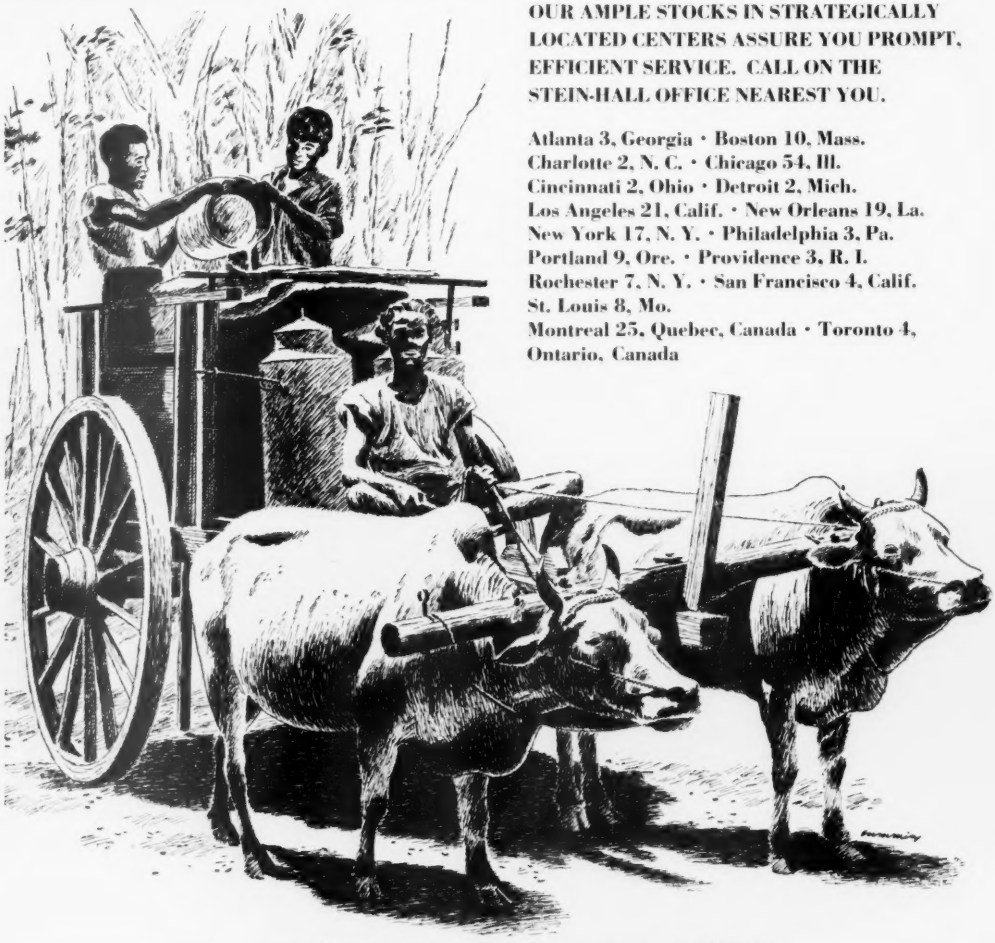
Crude rubber
natural & synthetic latex
latex compounds



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- Eliminates prior Masterbatching.
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- Provides easier moldability. Excellent appearance.
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your product has more to offer with

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There is a DIAMOND Precipitated Calcium Carbonate to meet almost every requirement of the rubber compounder. All are chemically precipitated under accurately controlled conditions to produce the highest degree of uniformity and purity. Your nearest DIAMOND Sales Office can help in selecting the type and grade most suited to your requirements.

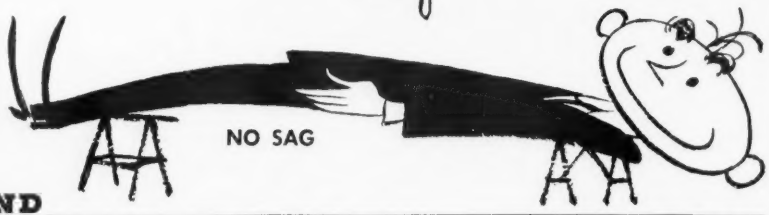
SUPER MULTIFEX®—ultra-fine particle, coated $CaCO_3$. Greatly increases tear resistance of natural rubber and GR-S and also gives good tensile strength and low modulus. Gives excellent flow properties to molded compounds.

MULTIFEX MM®—uncoated precipitated $CaCO_3$. Particle size slightly larger than SUPER MULTIFEX and therefore has slightly lower reinforcing effect. Requires less power to incorporate.

KALITE®—a semi-reinforcing coated filler which, at proper loading, will increase tear and tensile properties. Imparts specific processing advantages to calendered and extruded compounds. Provides smooth surface, reduced shrinkage, higher tube speeds with low heat generation. Recommended for highly loaded soft rubber compounds.

MILLICAL®—due to fine particle size, this uncoated precipitated calcium carbonate exerts a stiffening effect on green or uncured compounds. Prevents sagging or collapsing when cured in open steam. Recommended as primary filler in rubber floor tile.

NON-FER-AL®—an economical non-reinforcing filler for use in highly loaded compounds where low modulus is desired. Very pure. Non-abrasive.



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To United's 50 years of roll making experience can be added the advantages of its continuing program of metallurgical research, basically sound engineering and modern production facilities—a combination that made, and has kept, United Rolls favorites in outstanding processing plants throughout the world.

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The HOLMES CRUDE RUBBER BALE CUTTER

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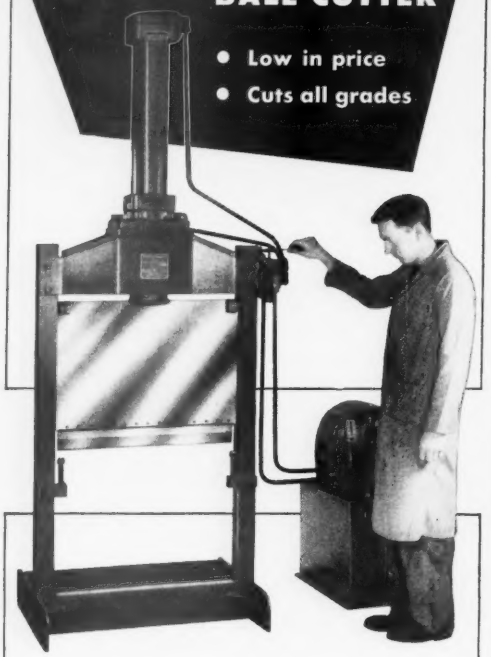
- Cuts all grades



Special control valve...set high up ...reduces injury hazard--makes it one of the safest cutters on the market

Top performance...low operating cost...maximum safety--these are the three main reasons why the Holmes Crude Rubber Bale Cutter is in daily use in so many leading plants in the rubber industry.

As illustrated, it is a complete, self-contained unit with pump, tank, and 5 H.P. motor. Knife--29¼" wide. Stroke--23". Height--8' 5". Floor Space--36" x 64". And--the initial cost is low.

***WRITE OR WIRE FOR SPECIFIC DETAILS**--regardless of your particular requirements. With 50 years know-how specializing in machinery and molds for the rubber industry--Holmes can help you solve your problems, too, as they have for so many others. No obligation, of course.*

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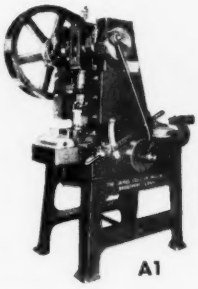
MODEL A-1
Cutting Heels at high speed production or short runs.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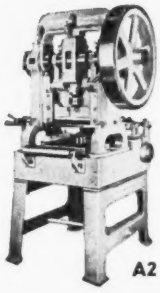
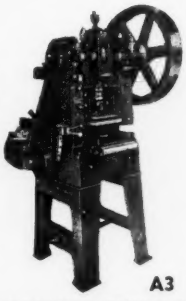

A2

MODEL A-2
Cutting Multiple Heels, Half and Full Soles with stock grain.

MODEL A-3
Cutting Multiple Heels and Taps with or across stock grain.

MODEL A-2s
(Not illustrated)
Cutting across grain of stock.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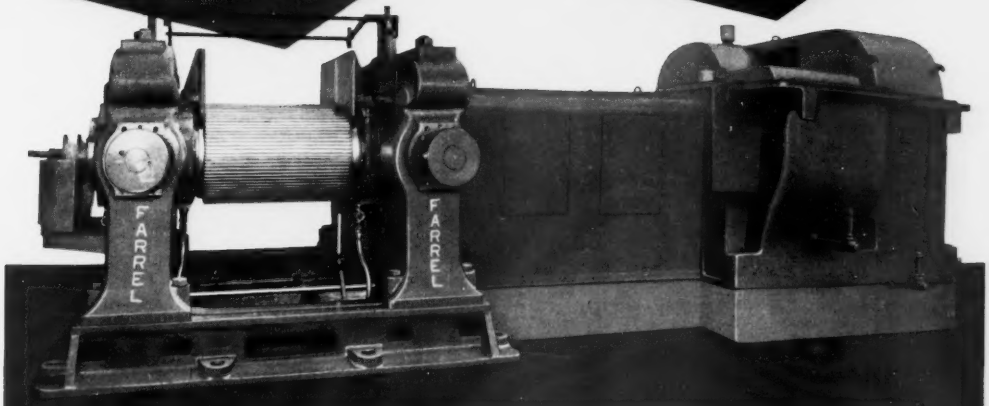

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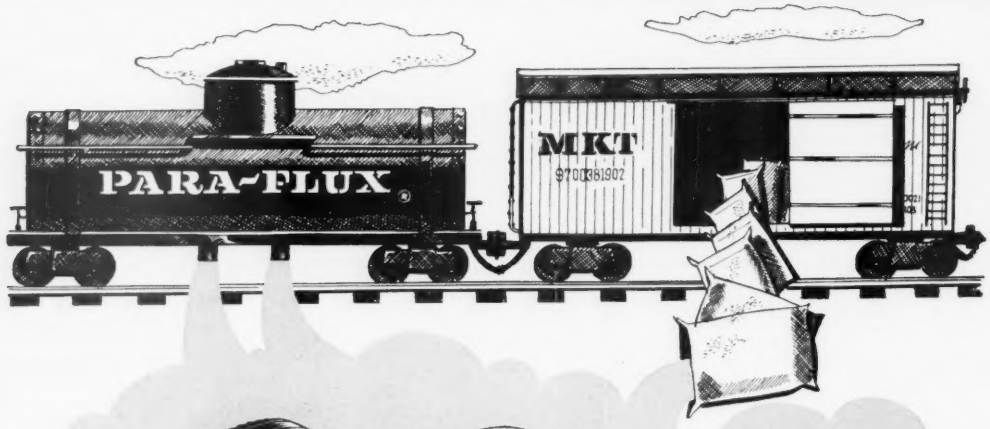

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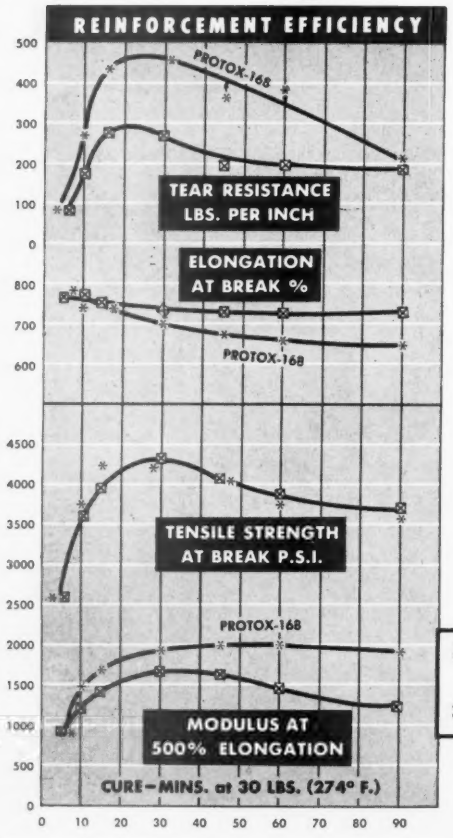

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STEARIC ACID	3
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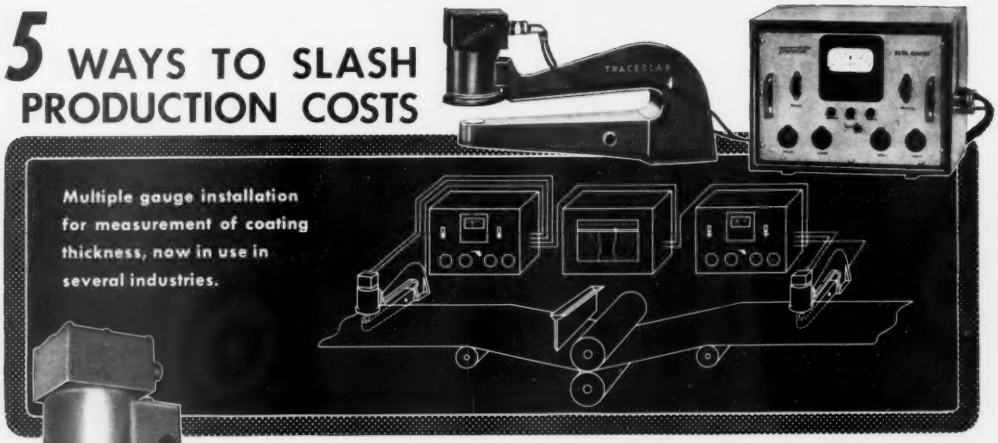

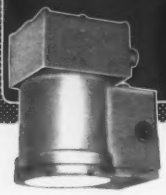

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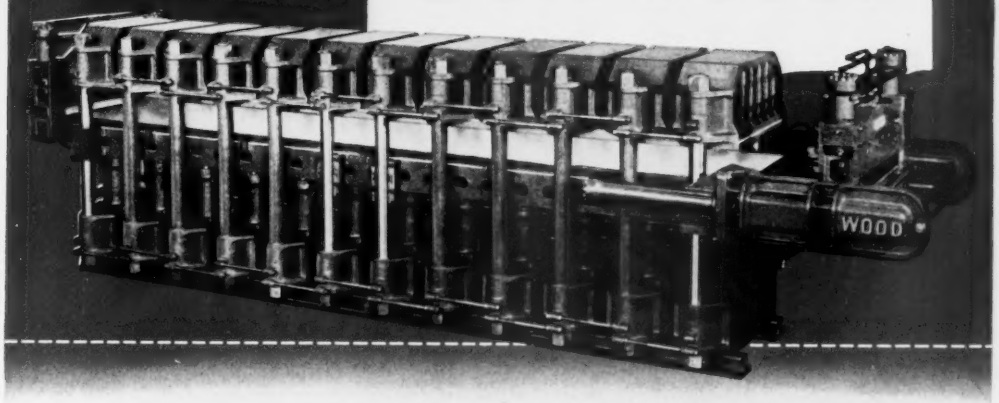

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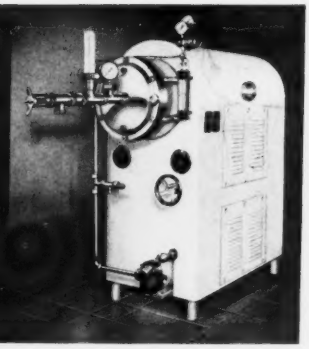

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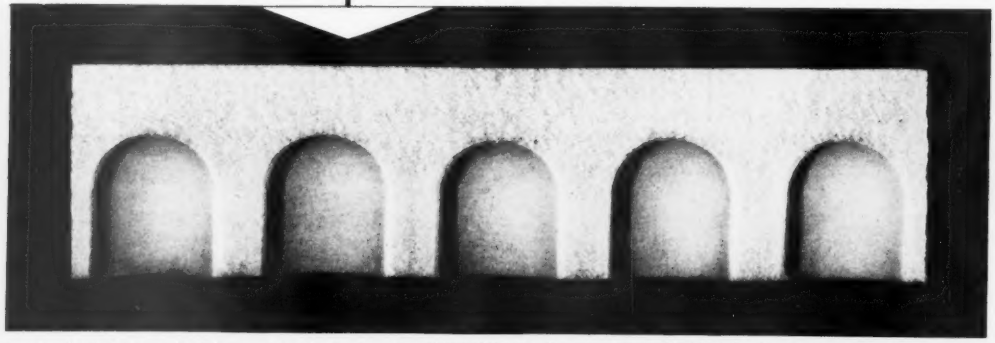

Unretouched photograph of foam rubber frothed on the AMF-OAKES Continuous, Automatic Frothing Machine. (Latex blow-up of 14)

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VOLUME 71
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Blue	BJ	Similar to B, with lower plasticity, easier processing.
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RUBBER AGE

Vol. 71, No. 2 MAY, 1952

Hypalon S-2—A New Elastomer

By R. R. WARNER

Polychemicals Department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware

HYPALON S-2 (chlorosulfonated polythene) is one of the most durable elastomers ever offered for use in the rubber industry. It is now being produced in pilot-plant quantities at Belle, West Va. Intensive compounding and testing, supplemented by practical factory trial and field tests in various applications, are proving that the new elastomer, when suitably compounded and cured, is outstanding in the following respects:

1. It is completely resistant to ozone.
2. It has abrasion resistance comparable with cold rubber.
3. It has outstanding resistance to weather.
4. It has excellent heat resistance and is suitable for service up to 250°F. and possibly even higher.
5. It is not brittle at —65°F., even without plasticizers.
6. It has low water absorption.
7. It does not require carbon black for reinforcement and thus has excellent color possibilities.
8. It has unusually good flex-life and resistance to crack-growth.
9. It can be blended with natural rubber, neoprene, Butyl, GR-S, and the nitrile rubbers. It imparts to the blends resistance to ozone, abrasion, heat, and weather, and greater modulus and hardness.

The above assets, although not all obtainable in a single compound, offer unusual opportunities to the rubber compounder in many applications. Even at this early introductory stage, Hypalon S-2 offers opportunities to manufacturers of tire tread stocks, white sidewall tires, white sidewall paints, automotive weatherstripping and window channels, coated fabrics, wire and cable covering, floor mats, footwear, closure gaskets, floor tiles, conveyor belt covering, refrigerator gaskets, protective coatings for rubber, adhesives, and miscellaneous molded goods. It is fully expected that it will be

Note: Hypalon S-2 is the registered trade-name used by E. I. du Pont de Nemours & Co., Inc., for its new chlorosulfonated polythene elastomer.

Note from the Editor...

Hypalon S-2, DuPont's new synthetic elastomer, was developed several years ago and has been trial tested by various rubber manufacturers during the past two years. The new product was publicly announced by the company at the recent meeting of the Division of Rubber Chemistry, A.C.S., held in Cincinnati, Ohio, on April 30-May 2, 1952. The introduction was accomplished through the presentation of three technical papers, the first covering general physical and chemical properties, the second devoted to the metal oxide curing systems required, and the third to a discussion of organic curing agents. All three of these papers will be published in due time. The article on Hypalon S-2 which is published in this current issue of RUBBER AGE is, however, the first article on the new elastomer to reach print, and we take special pride in once again being the first rubber journal to present data to the rubber manufacturing industry on still another of its basic raw materials, one which bids fair to rank high among the synthetic elastomers.—EDITOR.

highly satisfactory for many of these uses, as well as for others not mentioned or not yet under investigation.

Through the use of special compounding techniques, good oil resistance, low compression set, and low heat build-up can be obtained in Hypalon S-2 stocks. It can be handled on conventional rubber machinery and can be bonded to rubber and GR-S, using adhesives to overcome its lack of building tack and to achieve adequate adhesion.

The purpose of this article, in addition to emphasizing the opportunities in Hypalon S-2, is to outline in limited detail: (1) properties of the polymer; (2) methods of compounding and curing; (3) properties of typical vulcanizates; (4) processing characteristics; (5) properties of blends with other elastomers, and (6) applications.

Properties of the Polymer

At present, Hypalon S-2 polymer is supplied in a white, spongy, matted form. As such, it contains approximately 27.5% chlorine and 1.5% sulfur. Most of the chlorine is substituted along the hydrocarbon chain, and the sulfur is combined with chlorine and attached to the chain as sulfonyl chloride (SO_2Cl) groups. There is approximately one chlorine atom for every six to seven carbon atoms, and one sulfonyl chloride for every 100 carbon atoms. Substitution is believed to be random.

The uncured polymer is a somewhat tacky, rubber-like material of low strength. Its density is about 1.1. It is readily soluble in aromatic and chlorinated hydrocarbons and to some extent in ketones, esters, cyclic ethers, cyclic hydrocarbons, and primary and cyclic amines. It is insoluble in acids, aliphatic hydrocarbons, alcohols, and glycols.

The polymer by itself has excellent resistance to ozone attack, but it is degraded by exposure to ultraviolet light. Thin films will darken upon outdoor exposure. If used in the uncured state, therefore, Hypalon S-2 should be colored with materials that act as screens to ultraviolet light, if such exposure is anticipated.

Accelerated and actual storage tests indicate that uncompounded and uncured Hypalon S-2 polymer has a storage life of at least six months even during hot and humid weather. The actual storage life is probably much longer. Prolonged heating for several hours at 250°F. or higher will result in some decomposition of the sulfonyl chloride groups and loss of SO_2. This loss, if appreciable, will increase the Mooney and solution viscosities of the elastomer and will impair the physical properties of vulcanizates prepared from the polymer. Thus, prolonged storage at high temperatures should be avoided.

This polymer, although not hygroscopic, is sensitive to moisture and should be kept dry during storage. An appreciable increase in its water content may cause it to scorch during processing. For this same reason, compounding ingredients used with it also should be kept dry during storage.

Compounding Characteristics

Hypalon S-2 can be vulcanized with a combination of metal oxides, sulfur-type accelerators, and organic acids. Curing also can be effected with certain organic compounds in combination with acid acceptors. In either type of cure, the active groups which provide ultimate crosslinking sites are the sulfonyl chloride groups and the chlorine atoms along the hydrocarbon chain. The actual cure involves the reaction of these groups with metal oxides or with an organic compound.

Metal Oxide Cures: The actual mechanism of curing Hypalon S-2 is not fully understood. It is probable that crosslinks result from several different chemical reactions. It is fairly certain, in the case of metal oxide cures, that one of these reactions is the formation of a salt bridge with two sulfonyl chloride groups reacting with one polyvalent metal oxide as shown in the following equations:

$$2RSO_2Cl + 2H_2O \rightarrow 2RSO_2H + 2HCl \quad (1)$$

$$2HCl + MgO \rightarrow MgCl_2 + H_2O \quad (2)$$

$$2RSO_2H + MgO \rightarrow (RSO_2)_2Mg + H_2O \quad (3)$$

$$2RSO_2Cl + 2MgO \rightarrow (RSO_2)_2Mg + MgCl_2 \quad (4)$$

It can be seen from the above equations that water is involved and in effect is catalyzing the summary reaction outlined in equation 4. The presence of water is essential to this crosslinking step. If all of the ingredients are completely dry, little or no cure is obtained under normal curing conditions. On the other hand, if too much water is present, the compound will be scorchy. Hypalon S-2, as produced and shipped, contains enough moisture to permit a satisfactory cure at a satisfactory rate.

Suitable Metal Oxides: A number of metal oxides and compounds containing active metal oxides in their composition have been tried with Hypalon S-2. These are listed in Table I together with remarks concerning their use. Those for which most data are available are magnesium oxide, litharge, and Tri-Mal (tribasic lead maleate). Magnesium oxide gives vulcanizates that have excellent color possibilities but which have higher water absorption than compounds cured with lead oxides. Litharge gives products that have excellent water resistance but that tend to be discolored by exposure to ultraviolet light. As shown above, a metal chloride is formed during the curing step. The difference in the solubilities of magnesium chloride and lead chloride partly explains the difference in the water absorption of stocks cured with magnesium oxide and those cured with litharge. Tri-Mal has an advantage over magnesium oxide and litharge in producing compounds with both water resistance and light stability.

TABLE I—METAL OXIDES AND SALTS TESTED AS CURING AGENTS FOR HYPALON S-2

Component	Remarks
Magnesium oxide	Very good curing agent. Vulcanizates have high water absorption.
Lead monoxide	Excellent for curing. Stocks tend to discolor in sunlight.
Lead tetroxide	Fair. Low tensile strength.
Antimony trioxide	Poor. Low tensile strength.
Zinc oxide	Poor. Stocks do not age well.
Aluminum oxide	Fair cures. Stocks are water sensitive.
Barium oxide	Poor. Does not cure well.
Calcium oxide	Fair, but slow.
Titanium dioxide	Poor. Does not act as a curing agent.
Ferric oxide	Poor. Curing activity is weak.
Dibasic lead phosphite (Dyphos)	Good curing agent, but sensitive to heat and pressure.
Monohydrous tribasic lead sulfate (Tribase)	Good curing agent. Stocks discolor in sunlight.
Coprecipitated lead ortho-silicate and silica gel (Plumb-O-Sil A and B)	Good curing agent. Stocks discolor in sunlight.
Tribasic lead maleate (Tri-Mal)	Excellent for curing. Stocks have both water resistance and color stability.

With all metal oxide curing agents it has been found that optimum properties are achieved with volume loadings between 2% and 6%, based on the elastomer. As would be expected, the particle size of the metal oxide governs the quantity needed for optimum properties. For example, with litharge stocks, a smaller quantity of the finer grades is needed to achieve adequate tensile strength and modulus. Most of the compounding work done to date has been based on compounds containing a rubber grade of litharge with a particle size in the 2 to 10 micron range. When litharge with a particle size of 1 micron or less is used, the quantity can be nearly halved (from 40 parts to 25 parts) resulting in almost the same tensile properties. Aging properties, however, are not quite as good with smaller quantities of litharge, unless a compatible acid acceptor (such as 1 part of AgeRite Resin D) is incorporated. Scorching may result if more than 25 parts of fine particle size litharge is used.

Accelerators: Certain compounds accelerate the cure of Hypalon S-2, although the mechanism is unknown. It is possible that they give a secondary cure through incipient unsaturation developed during the vulcanization. Some of those that have been tried are listed in Table II and are rated according to general observations and tests. Tetrone A and MBT are very satisfactory and have been used in most of the experimental work done in the DuPont Laboratories. Some of the accelerators, such as Accelerator 808, are too active and cause scorching. Others, such as Permalux and DPG, are useful in supplementing Tetrone A and MBT, although the use of such super accelerators may impair aging. If they are used, air-oven aging properties should be checked. Undoubtedly there are other accelerators that will be found satisfactory after further research. Usually one to three parts of an accelerator, depending on the kind of filler and curing agent used, are sufficient for good cures

Organic Acids: To obtain optimum tensile properties, organic acids should be added to Hypalon S-2 compositions. Those recommended include Staybelite resin and wood rosin. The way in which these rosin acids enter into the curing reaction has not yet been determined. Without these acidic ingredients, only about half the tensile strength available is obtained. Staybelite resin and wood rosin also act as processing aids, in that they reduce the viscosity and provide a more workable mix. In general, about 2.5 parts of Staybelite resin are satisfactory for most purposes. Higher concentrations may increase tensile strength, elongation, hardness, flex-life, and resistance to crack-growth, but result in poorer low temperature properties and slower recovery from deformation.

Organic Curing Agents: Hypalon S-2 can be cured with certain organic compounds in combination with inorganic or organic acid acceptors. Classes of organic compounds that effect a cure are aromatic and aliphatic diamines, ureas and thioureas, amides and thioamides, carbamates and thiocarbamates, cyanates and isocyanates, guanidines, oximes and nitroso compounds, and substituted thiazoles. It is probable that the crosslinking reactions include sulfonamide or sulfonic ester formation.

The mechanism by which other organic compounds, such as 2-mercaptoimidazoline (NA-22) and dipentamethylenethiuram tetrasulfide (Tetrone A), cure Hypalon S-2 is as yet obscure. There is a strong possibility, however, that sulfur-type crosslinking may occur as a result of dehydrohalogenation and incipient unsaturation during the vulcanization.

Some of the organic compounds that have been tested, such as ethylenediamine and diphenylguanidine (DPG), are extremely reactive. For this reason they are unsuitable as primary curing agents, although DPG is an excellent accelerator when used in small quantities with metal oxides. Almost all of the organic curing agents tested to date produce compounds that are more sensitive to water than the metal oxide stocks. They tend to result in stocks that are high in elongation and tensile strength. Carbon black improves these properties in some cases, while calcium carbonate seems to act merely as an acid acceptor. Detailed information on resistance to abrasion, heat and weather, compression set, flex-life, etc., is not yet available.

Fillers: Natural rubber and other elastomers usually require carbon black fillers to achieve useful combinations of properties. Unlike these materials, Hypalon S-2 exhibits excellent properties without fillers or when loaded with either white or black fillers. Hence, outstanding abrasion resistance, flex-life, and weather resistance can be obtained in stocks of a variety of colors with no sacrifice of other physical properties.

The use of fillers, nevertheless, has a profound effect on certain physical properties of the vulcanizates. Good compounds have been obtained at volume loadings of filler ranging from zero to the highest used in other elastomers. These fillers include the various carbon blacks, the whitings ($CaCO_3$), the clays (both hard and soft), barytes, blanc fixe, wood flour, silica gel, and calcium silicate (Silene EF). Since silica gel and calcium silicate contain absorbed water or water of hydration, this results in scorching and boardiness if they are used in substantial quantities. Their use is not recommended unless a rapid cure is desired. With most of the other fillers the effects are more moderate, and generalizations are possible. Fillers increase the modulus, stiffness, and hardness without greatly affecting the tensile strength. They greatly improve strength at high temperatures; in this respect Hypalon S-2 appears unique in its response to white fillers. On the other hand, fillers impair low temperature properties. Typical effects are shown in Tables III and IV.

TABLE II—COMPOUNDS USED AS ACCELERATORS FOR HYPALON S-2

Trade Name	Chemical Composition	Remarks
Tetrone A	Dipentamethylenethiuram tetrasulfide	Good
MBT	2-Mercaptobenzothiazole	Good
MBTS	Benzothiazyl disulfide	Good, but slow
NA-22	2-Mercaptoimidazoline	Good
Thiuram M	Tetramethylthiuram disulfide	Slow
Butyl Zimate	Zinc dibutyldithiocarbamate	Good, but dark colored
Morfex 33	25% Tetramethylthiuram monosulfide + 75% zinc-2-mercaptobenzothiazole	Slow
DPG	Diphenylguanidine	Very fast curing; useful in conjunction with other accelerators
Permalux	Di-ortho-tolylguanidine salt of dicatechol borate	Very fast curing; useful in conjunction with other accelerators
Accelerator 808	Butyraldehyde-aniline condensation product	Poor, scorchy

TABLE III—EFFECT OF FILLERS ON TENSILE PROPERTIES OF HYPALON S-2 COMPOUNDS AT VARIOUS TEMPERATURES

Base Composition: Hypalon S-2, 100; Wood Rosin, 5; Litharge, 40; MBT, 3.

Cure: 30 Minutes @ 320° F.

Filler	Volume Per Cent Hypalon S-2	—Measured at 32° F.— 100% Modulus (p.s.i)	Tensile Strength (p.s.i)	Elongation (Per Cent)	—Measured at 77° F.— 100% Modulus (p.s.i)	Tensile Strength (p.s.i)	Elongation (Per Cent)	—Measured at 122° F.— 100% Modulus (p.s.i)	Tensile Strength (p.s.i)	Elongation (Per Cent)	—Measured at 158° F.— 100% Modulus (p.s.i)	Tensile Strength (p.s.i)	Elongation (Per Cent)	—Measured at 194° F.— 100% Modulus (p.s.i)	Tensile Strength (p.s.i)	Elongation (Per Cent)
Base Stock	89	1200	4000+	400+	700	2775	400	425	1350	350	300	1125	400	150	575	350
Super Multifex	80	1675	4400	300	1275	3050	325	575	1950	350	400	1325	325	225	1050	350
	70	3025	4150	200	2500	2950	200	1025	1975	250	700	1600	225	500	1300	275
	60	4250	4250	100	3000	3000	100	1575	2075	150	925	1575	150	725	1450	175
Iceberg Pigment	80	1950	3650	300	1375	2450	375	700	1650	350	325	1100	300	275	900	325
	70	2750	3200	200	1975	2000	225	1000	1500	275	700	1100	250	550	1000	275
	60	3375	3375	100	2300	2300	100	1600	1600	100	925	1250	125	900	1125	175
Ti-Pure R-110	80	2725	4050	275	1350	2775	350	675	1800	375	425	——	——	325	1175	350
	70	2850	3700	200	2050	2525	225	950	1900	250	600	1375	250	500	1300	250
	60	3850	3850	100	2725	2725	100	1625	1950	175	1075	1575	175	750	1400	175
Suprex Clay	80	4000	4275	225	1875	2675	325	875	1775	325	550	1300	350	375	1050	350
	70	3175	4375	175	3125	3175	125	1575	2000	175	1075	1600	175	700	1250	175
	60	4175	4175	100	——	3200	75	1825	1825	100	1500	1500	100	1150	1150	100
SRF Black	80	2100	4450	250	1525	2925	200	725	2075	275	525	1550	250	450	1325	250
	70	3500	4350	125	2675	2975	150	1200	1975	150	825	1650	200	750	1400	175
	60	——	4050	75	——	3100	75	2375	2375	100	1775	1775	100	1675	1675	100
EPC Black	80	2100	4375	225	1700	2975	225	1250	1725	200	625	1075	175	450	1175	250
	70	3050	4275	125	3150	3400	125	1700	2525	150	975	1550	150	1025	1425	150
	60	——	3225	75	——	2650	50	——	2050	75	——	1550	75	——	1050	50
Blanc Fixe	80	1875	3800	300	1100	2400	375	525	1550	375	350	——	——	250	975	325
	70	3000	3400	200	2050	2200	200	1075	1675	225	675	1325	275	475	1200	250
	60	2875	3550	125	2300	2375	125	1500	1800	175	900	1350	175	575	1050	175
Hi-Sil	80	1850	4150	275	975	1950	275	475	1800	350	——	——	——	225	800	325
	70	2500	3675	225	1800	2400	300	950	1825	350	700	1450	325	450	1175	325
	60	3750	3750	100	2650	2650	100	1950	1950	100	1575	1575	100	1275	1275	100

TABLE IV—EFFECT OF FILLERS ON PROPERTIES OF HYPALON S-2 COMPOUNDS AT ROOM TEMPERATURE

Base Stock: Hypalon S-2, 100; Staybelite Resin, 9; Tri-Mal, 35; MBT, 2
Cure: 30 Minutes @ 320° F.

Filler	Volume % Hypalon S-2	Tensile Strength (p.s.i.)	Elongation (Per Cent)	100% Modulus (p.s.i.)	Hardness Durometer C	Stiffness, Timius Olsen
Base Stock	85	3065	510	365	28	565
Super Multifex	40	2965	25	—	—	10,575
	50	2850	75	—	74	6,230
	60	2575	200	2090	58	2,335
	70	2335	400	950	45	1,525
	80	3160	475	490	—	870
Iceberg Pigment	50	1750	75	—	68	3,285
	60	1550	175	1550	58	2,550
	70	1625	375	1150	45	1,460
	80	2435	490	575	32	900
Ti-Pure R-110	50	1910	110	1910	67	2,400
	60	2050	235	1650	54	1,915
	70	2165	410	900	41	1,015
	80	2640	465	440	32	860
Suprex Clay	40	2000	15	—	82	16,700
	50	2110	50	—	72	5,830
	60	1915	100	1915	58	1,670
	70	1815	340	1285	48	1,180
	80	2510	475	685	32	1,030
P-33	40	2450	50	—	86	5,930
	50	2610	75	—	70	2,265
	60	3060	210	1475	53	1,310
	70	2790	310	725	45	780
	80	3210	485	460	31	875
Continental AA	50	2415	50	—	88	5,780
	60	2350	75	—	69	3,350
	70	2465	200	1365	53	1,310
	80	3050	415	610	35	1,100
Witco A Whiting	50	1075	175	—	62	2,980
	60	1235	375	825	53	1,940
	70	1675	460	640	40	1,250
	80	2550	500	425	31	835

The particle size of the filler, as well as the type, is of some consequence in determining the final physical properties of Hypalon S-2 compounds. This fact is illustrated in Table V, where a comparison is made between calcium carbonates differing in particle size. Higher modulus is developed with smaller particles. High loadings of the "soft" large fillers, such as P-33 black and Witco A whiting, can be used with little effect on physical properties.

Colors: Since Hypalon S-2 does not require carbon black to obtain good mechanical properties, it can be compounded in a wide range of colors. Uncolored gum stocks cured with litharge have withstood more than two years of outdoor exposure with no significant change in tensile properties. However, exposure to high intensity ultraviolet light eventually starts degradation, and colors afford some protection. Uncolored stocks cured with magnesia or Tri-Mal are more susceptible to outdoor degradation, and colors are essential for good weather aging. Tests, to date, have been limited largely to a few inert inorganic colors, since many organic compounds react with the polymer during cure. Results are summarized briefly in Table VI.

It is interesting to note that very good colors can be obtained with litharge as the curing agent in spite of its tendency to cause darkening on exposure to sunlight. The curing temperature is important if colors are to be used with stocks of this type, and it should be kept below 290°F. for best results. Encouraging results even with white stocks have been obtained through the addition of special stabilizers, such as lead stearate and barium-cadmium complexes.

Plasticizers: The addition of plasticizers to Hypalon S-2 compounds may be desirable for some uses, particularly those that require a Shore Durometer hardness of less than 60 on the A scale, or where

TABLE V—EFFECT OF PARTICLE SIZE OF FILLER ON HYPALON S-2 VULCANIZATES

(Press Cure: 30 Minutes @ 320° F.)

Ingredients	Compound M-364 Parts by Weight	Compound M-366 Parts by Weight
Hypalon S-2	100.0	100.0
Staybelite	2.5	2.5
Magnesia	20.0	20.0
Tetrone A	1.0	1.0
Witcarb R *	74.5	—
Witcarb R-12 †	—	74.5
Tensile Strength (psi)	2610	2110
100% Modulus (psi)	2400	1475
Elongation (%)	100	175

* Average particle size—0.050 micron. † Average particle size—0.15 micron.

TABLE VI—COLORS TESTED IN HYPALON S-2 COMPOUNDS

Color	Type	Source	Remarks
Red	R-2199 Oxide	C. K. Williams Co.	Good. Color stable on weathering.
Red	Indanthrone Red		Detrimental to physical properties on weathering.
Red	Pure Cadmium Selenide Red 1124 and 1127	Paul Uhlich Co.	Good.
Red	Dark Red Pigment 10156	B. F. Drakenfeld Co.	Good. Tested only in litharge-cured stocks.
Red	Pure Indian Red R-9998	C. K. Williams Co.	Good. Tested only in litharge-cured stocks.
Red	Pure Red Oxide R-4098	C. K. Williams Co.	Good. Tested only in litharge-cured stocks.
Blue	National Blue 10034	B. F. Drakenfeld Co.	Good. Tested only in litharge-cured stocks.
Blue	Ultramarine Blue		Good. Tested only in litharge-cured stocks.
Blue	Monastral Blue BT-284-D	E. I. du Pont de Nemours Co., Inc.	Retards cure and is not stable on weathering unless cured at temperatures below 275° F.
Yellow	Chrome Yellow Light Y-433-D	Du Pont	Good. Color stable on weathering.
Black	Most Carbon Blacks		Excellent.
White	Ti Pure R-110	Du Pont	Excellent.
Blue	Indanthrone Blue Lake High Stg'th-BP-242-D	Du Pont	Fair. Some fading in weather.
Orange	Molybdate Orange YE-637-D	Du Pont	Good. Tested only in litharge-cured stocks.
Red	Watchung Red RG-428-D	Du Pont	Good. Tested only in litharge-cured stocks.
Red	Bon Red Dark RT-525-DWJ	Du Pont	Good. Tested only in litharge-cured stocks.
Red	Alizarin Red Maroon Toning Lake RP-293-D	Du Pont	Fair. Tested only in litharge-cured stocks.

greater flexibility is needed. Many materials have been tested, and several of the most satisfactory are shown in Table VII. As a general rule, plasticizers should be avoided in stocks where maximum durability is desired because unplasticized stocks are usually superior in weathering, heat aging, tensile strength and resistance to abrasion.

Antioxidants: Antioxidants are not necessary in compounding Hypalon S-2. The product is completely saturated chemically and thus has no ready sites for oxidation. It may be possible, however, through the use of certain chemicals commonly classed as antioxidants, to improve durability even beyond the excellent results now obtainable without them. An example of one that seems to benefit the polymer is AgeRite Resin D. This antioxidant produces a marked improvement in the heat resistance of stocks. Studies now under way may disclose other antioxidants that will improve durability.

Properties of the Vulcanizates

In the DuPont Laboratories many vulcanizates have been made using the compounding techniques described in the foregoing section. Some of these compounds, which at present can be called typical, are presented in Table VIII, together with the test data. As is true with other elastomers, the properties of Hypalon S-2 compounds depend on the compounding ingredients and the manner in which the recipes are processed. The following is a discussion of the general characteristics of Hypalon S-2 compositions, with some specific suggestions as to ways of modifying these characteristics where desirable.

Resistance to Ozone: Hypalon S-2 is unaffected by ozone. Exposed samples, uncured, cured, filled and colored in various ways, plasticized or unplasticized, have yet to show any ozone attack. In the test the samples are stressed and exposed to 150 p.p.m. ozone for 14 hours. Outdoor exposure tests under both dynamic and static conditions confirm these laboratory results.

Tensile Properties: The tensile properties of the elastomer vary, of course, with the recipe and the state of cure. As a rule, Hypalon S-2 compounds are stiffer than natural rubber, considerably higher in modulus, and lower in elongation. Tensile strengths as high as 3500 psi can be obtained. Moduli over 2000 psi at 100

TABLE VII—PLASTICIZERS FOR HYPALON S-2 COMPOUNDS

Name or Abbreviation	Type	Remarks
D.O.P.	Di-2-ethylhexyl phthalate	Improves resilience and lowers compression set, but is volatile on heat-aging. Reduces tensile strength and modulus.
Paraplex G-50	Polyester	Similar to D.O.P., but better on heat-aging. Low-temperature properties good, but not as good as D.O.P.
Light Circo Oil	Petroleum hydrocarbon	Very good plasticizer and processing aid. Reduces tensile strength and modulus somewhat.
Kenflex B	Polymerized naphthenic derivative of petroleum	Similar to Circo oil, but has very little effect on tensile strength and modulus. Not recommended for low temperature applications.
Socony Vacuum Compounding Material Type I	Petroleum Residue	About like Circo oil, but has less effect on tensile strength and modulus. Imparts some building tack to compounds.
Boiled Linseed Oil		Similar to Circo oil, but better low temperature properties.
Paraplex G-60	Polyester	Similar to Paraplex G-50, but better at low temperatures.
Natural Rubber plus Sulfur	Smoked Sheets	Very effective softener for Hypalon S-2 compounds.
Sundex 53	Petroleum Base	Similar to Circo oil, but better on heat aging because of lower volatility. Only slight effect on tensile strength, abrasion resistance, etc.

Table VIII—Typical Hypalon S-2 Compositions and Their Properties

(Press Cure: 30 Minutes @ 320° F.)

Compound Nos.		M-726	M-727	M-740	M-773	M-787	M-831
Ingredients in Parts by Weight	Hypalon S-2	100.0	100.0	100.0	100.0	100.0	100.0
	Staybelite Resin	2.5	—	2.5	2.5	2.5	—
	Wood Rosin WG	—	10.0	—	—	—	10.0
	Super Multifex	80.0	—	—	—	—	—
	Furnace Black (SRF)	—	—	—	—	—	39.4
	Channel Black (EPC)	—	39.4	—	—	—	—
	Suprex Clay	—	—	69.5	—	—	—
	Iceberg Pigment	—	—	—	—	70.5	—
	Magnesia	20.0	—	—	—	—	—
	Litharge	—	40.0	—	—	—	40.0
	Tri-Mal	—	—	37.5	33.0	37.5	—
	Tetrone A	1.0	—	—	—	—	—
	MBT	—	3.0	3.0	3.0	3.0	3.0
Volume % Hypalon S-2		70.8	70.8	70.8	90.1	70.8	70.8
Weight % Hypalon S-2		49.2	52.0	47.1	72.5	46.8	—
Mooney Plasticity	Minimum Reading MS at 250° F.	45.5	25.0	20.5	14.0	24.5	17.5
	Minutes to 100 MS at 250° F.	74.0	29.0	89.0	100.0	70.5	50.0
Tensile Strength (p.s.i.)	ASTM D-412-41	3460	3365	2640	2575	1695	2560
100% Modulus (p.s.i.)	ASTM D-412-41	1735	1375	2180	200/915 †	1330	1000
Elongation (%)	ASTM D-412-41	200	225	175	560	285	310
Residual Elongation (%)	ASTM D-412-41	5	12	9	30	13	10
Permanent Set (%)	ASTM D-412-41	8	19	15	35	23	22
Compression Set After 22 hours at 158° F. (%)	ASTM D-395-47T, Method A	6.3	29.0	26.9	36.1	28.3	29.1
Density (g./ml. at 73° F.)		1.56	1.50	1.68	1.40	1.70	1.52
Stiffness (p.s.i.)	ASTM D-747-48T	1390	2420	1990	500	1575	1410
Shore Durometer Hardness (C)	ASTM D-676-47T	45	52	47	26	46	42
After 7 days at 212° F.	ASTM D-676-47T	53	56	51	26	51	47
Shore Durometer Hardness (A)	ASTM D-676-47T	77	85	80	61	79	76
After 7 days at 212° F.	ASTM D-676-47T	82	86	79	60	82	79
Tear Strength (lb./in.)	ASTM D-624-48T	356	218	210	205	216	209
Low Temperature Brittleness	ASTM D-746-44T	—13° F.	—24° F.	— 6° F.	—78° F.	—10° F.	—13° F.
Low Temperature Torsion in Methanol	(*)						
T10		—11° F.	— 2° F.	—11° F.	—28° F.	—11° F.	— 5° F.
TF		—22° F.	—15° F.	—20° F.	—42° F.	—20° F.	—23° F.
Crack Growth (De Mattia)	ASTM D-813-44T	¾" at 100,000 cycles— .0025"/KC.	⅜" at 100,000 cycles— .00563"/KC.	⅜" at 247,000 cycles— .0015"/KC.	⅛" at 220,000 cycles— .0031"/KC.	¼" at 220,000 cycles— .0023"/KC.	¾" at 10,000,000 cycles— .00003"/KC.
Bend Flexing (De Mattia)	ASTM D-430-40	No crack at 100,000 cycles	No crack at 100,000 cycles	No crack at 247,000 cycles	No crack at 220,000 cycles	No crack at 220,000 cycles	No crack at 10,000,000 cycles
Abrasion Resistance	Du Pont Abrader						
Weight Loss (gm./20 min.)		.186	.228	.363	.423	.581	.380
Volume Loss (cc/20 min.)		.121	.152	.216	.302	.342	.250
Volume Loss (cc/h.p. hr.)		23.2	35.5	60.8	49.1	85.8	54.0
Resilience at 167° F.	Yerzley	60.6	52.1	61.0	66.7	60.2	60.8
Heat Build-up	ASTM D-623-41T						
5 min.		84° F.	102° F.	79° F.	66° F.	81° F.	77° F.
10 min.		111° F.	149° F.**	117° F.	90° F.	115° F.	113° F.
20 min.		127° F.	—	178° F.	118° F.	156° F.	145° F.
Water Absorption							
40 Hr. at 122° F. (%)		7	0.35	0.35	0.28	0.25	0.59
7 days at 158° F. (%)		34	0.77	0.94	1.22	0.82	0.68
—mg./sq. in.		335	7.5	9.5	8.7	7.6	7.38
Tensile Properties After Soaking in Water 40 hrs. at 122° F.	ASTM D-412-41						
Tensile Strength (p.s.i.)		2275	3390	2185	2250	1465	2550
100% Modulus (p.s.i.)		1110	1290	1765	170/790 †	1075	975
% Elongation		365	235	200	565	310	300
Residual Elongation (%)		42	12	12	33	15	10
Dielectric Strength, 35-40 mils thick (Volts/mil)	ASTM D-149-44	600	290	973	470	685	164
Power Factor (1000 cycles)	ASTM D-150-47T	.024	.067	.0195	.0186	.0185	.0415
Dielectric Constant (1000 cycles)	ASTM D-150-47T	7.3	13.5	6.5	6.6	6.0	8.4
Volume Resistivity (ohm/cm)	ASTM D-991-48T	2.7×10^{13}	4.0×10^{13}	1.4×10^{14}	5.1×10^{12}	1.6×10^{13}	3.0×10^{12}
Ozone Aging, 14 hrs. at 150 ppm		No change	No change	No change	No change	No change	No change

* Clash and Berg, *Ind. Eng. Chem.*, Vol. 34, p. 1218 (1942). ** Blew out. † Second figure is modulus at 300%.

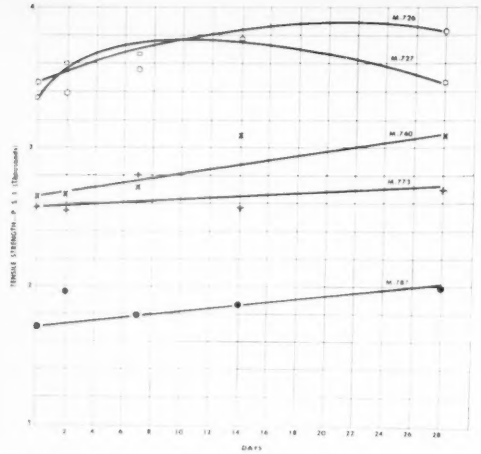

FIG. 1—Change in tensile strength of Hypalon S-2 vulcanizates during oxygen bomb aging at 158°F. (ASTM D-572-48).

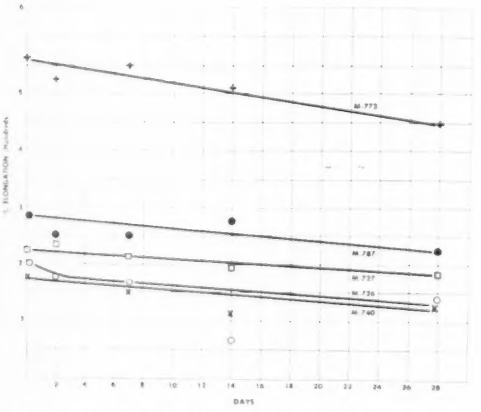

FIG. 2—Change in elongation of Hypalon S-2 vulcanizates during oxygen bomb aging at 158°F. (ASTM D-572-48).

per cent elongation indicate the toughness of this elastomer. Even gum stocks have a high modulus. Elongation at break varies from 200 per cent to 600 per cent, depending upon the degree of loading and the tightness of cure. If greater flexibility is needed, plasticizers can be used with satisfactory results.

Shore Hardness: Compared to other elastomers, Hypalon S-2 is relatively hard. Hardness on the Shore Durometer A scale ranges from 60 in a gum stock to 95, depending on the type and quantity of filler. Where necessary, this hardness can be reduced by the use of plasticizers, the most effective being natural rubber.

Tear Strength: The tear strength of Hypalon S-2 compounds is comparable to that of other synthetic elastomers. It is not as good as black-filled natural rubber but is adequate for the majority of applications. The tear strength and toughness of uncured stocks is good. In this respect it is better than the other synthetic elastomers.

Resistance to Abrasion: One of the outstanding properties of the new elastomer is its abrasion resistance. This fact has been demonstrated not only by laboratory tests but by test use in floor coverings, coated fabrics, soles and heels, and in tires. As would be expected, resistance to abrasion depends on how the polymer is compounded. In laboratory tests using the Du-Pont Abrader, carbon black, carbonate, and clay fillers give excellent results. In this respect, it is better to use low volume loadings of filler rather than high volume, although excellent results are still obtained with volume loadings of 50 per cent and above.

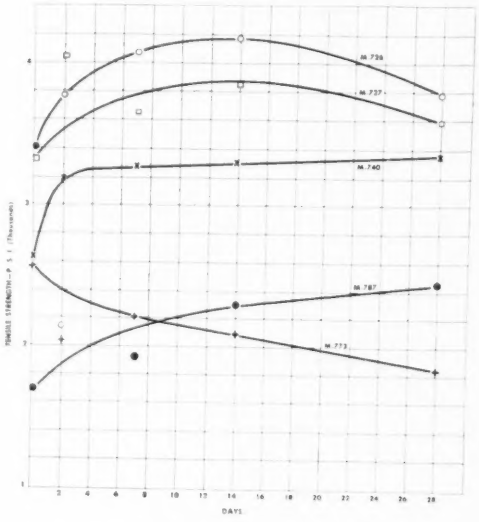

FIG. 3—Change in tensile strength of Hypalon S-2 vulcanizates during air oven aging at 212°F. (ASTM D-573-48).

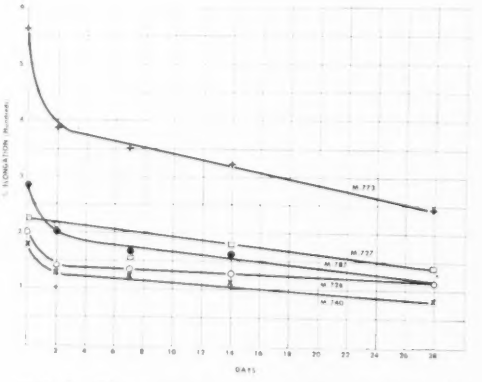

FIG. 4—Change in elongation of Hypalon S-2 vulcanizates during air oven aging at 212°F. (ASTM D-573-48).

Flex-Life: Even though Hypalon S-2 compounds are stiffer than other elastomer vulcanizates, they have excellent flex-life and resistance to crack-growth, if properly compounded. Some compounds such as M-831 shown in Table VIII withstand more than 10,000,000 flexes on a DeMattia tester without appreciable crack-growth. A detailed story on all the factors affecting this property is not yet available, but tests to date show that results depend on the type and quantity of filler, the amount of rosin-type acid, the degree of dispersion, and the state of cure. The amount of rosin or Staybelite resin seems to be the most important consideration, with larger quantities giving better flex-life.

Heat Resistance: Air and oxygen under pressure do not seriously affect the properties of Hypalon S-2 vulcanizates at temperatures up to 212°F. as shown in Figures 1 through 4. Virtually the only effect is a tightening of the cure, indicated by slight increases in tensile strength and decreases in elongation. Even at 257°F., stocks show marked resistance to degradation. Some data at this temperature are presented in Table IX. It will be noted that some of the stocks shown in Table IX contain small amounts of AgeRite Resin D. This particular compound is very effective in improving resistance to degradation at elevated temperatures. Others may be found as research continues.

Apparently, Hypalon S-2 is not suitable for continuous service at temperatures much higher than 250°F. At 300°F., compositions tested to date have shown serious losses in tensile strength and elongation, accompanied by increases in hardness and stiffness, although some flexibility and strength is retained after 100 hours' exposure.

On the basis of these observations it is apparent that Hypalon S-2 is far superior to most of the other elastomers in resistance to heat. It may well fill part of the gap existing between neoprene, which is one of the best, and silicone rubber, which is excellent.

Weathering: Hypalon S-2 compounds when properly formulated have unusually good outdoor durability. This conclusion is based on Weatherometer data and exposure in Wilmington, Delaware, and in Florida. Some of the samples have been exposed for 30 months in Florida with only minor changes in tensile strength, elongation, and low temperature brittleness. Exposure of coated fabrics in Florida for two years actually resulted in improved toughness, due probably to a slow continuation of the cure. Dynamic tests in Florida also gave unusually good results. White stocks cured either with magnesia or Tri-Mal have remained white during one year's outdoor exposure.

Complete information on the weather effects of types and quantities of fillers, colors, curing agents, accelerators, plasticizers, etc., is not yet available, but data obtained thus far indicate that the following rules should apply in order to achieve greatest durability:

1. No more than 35% filler by volume should be used.
2. The use of plasticizers should be avoided.
3. Stocks cured with magnesium oxide or Tri-Mal should be colored as a protection against ultraviolet light.

Water Absorption: Stocks with very low water absorption and swell can be obtained with litharge and Tri-Mal cures. The data presented in Table X show only minor increases in volume and weight after soaking in boiling water for 70 hours.

When Hypalon S-2 is cured with magnesium oxide, water absorption is fairly high, although adequate mechanical properties are retained. Where water absorption is not critical, such stocks may be entirely adequate. For example, very satisfactory floor tile and upholstery-type coated fabrics have been made using a magnesium oxide cure.

Compression Set: Where compression set is of considerable importance, particular attention must be given to curing. As is true with most elastomers, a tight cure is necessary for obtaining low values. Fairly good results can be obtained using magnesium oxide as the curing agent or by supplementing the cure of litharge stocks with a small amount of diphenylguanidine (DPG) or similar material. The effect of DPG is shown in Figure 5.

TABLE IX—AIR OVEN AGING OF HYPALON S-2 STOCKS AT 257°F.

(ASTM D-573-48)

Compound Nos.	M-809	M-831	M-1274	M-1399	M-1402
Hypalon S-2	100.0	100.0	100.0	100.0	100.0
Staybelite Resin	2.5	—	10.0	2.5	2.5
Wood Rosin	—	10.0	—	—	—
Litharge	—	40.0	40.0	25.0	40.0
Tri-Mal	37.5	—	—	—	—
MBT	2.0	3.0	2.0	2.0	2.0
Ti-Pure R-110	114.0	—	60.5	—	—
Super Multiflex	—	—	—	28.0	—
Iceberg Pigment	—	—	—	—	26.0
Continex SRF	—	39.4	—	—	—
AgeRite Resin D	—	—	2.0	1.0	1.0
Curing Time (min.)	30	30	30	30	30
Curing Temperature (°F.)	320	320	320	266	266
Original Properties					
Tensile Strength (p.s.i.)	1950	2600	2120	2485	2410
Elongation (%)	370	295	350	300	440
Properties After Aging in Air Oven at 257° F. for 7 Days					
Tensile Strength (p.s.i.)	2130	3100	2415	2755	2085
Elongation (%)	120	175	240	250	220
Properties After Aging in Air Oven at 257° F. for 14 Days					
Tensile Strength (p.s.i.)	2200	2640	—	—	—
Elongation (%)	80	65	—	—	—

TABLE X—EFFECT OF IMMERSION OF HYPALON S-2 COMPOUNDS IN BOILING WATER FOR 70 HOURS

Compounds Tested

Compound Nos.	M-727	RH-1	RH-2	RH-3
Hypalon S-2	100.0	100.0	100.0	100.0
Wood Rosin	10.0	10.0	10.0	—
Litharge	40.0	40.0	40.0	40.0
EPC Black	39.4	—	—	—
MBT	3.0	3.0	3.0	3.0
Kentlex B	—	—	60.0	—
Celite 270	—	—	—	50.0
Staybelite Resin	—	—	—	2.5
SRF Black	—	12.5	39.4	6.0

Effect of Immersion

	Tensile Strength			Elongation		
	Before	After	% Change	Before	After	% Change
M-727	3055	2450	—20	255	205	—20
RH-1	2845	2350	—19	175	125	—30
RH-2	2330	1820	—22	75	125	+69
RH-3	2980	2870	—3.6	85	100	+17

	% Weight Change	% Volume Change
M-727	+1.10	+0.13
RH-1	+0.60	—0.11
RH-2	+1.65	+1.30
RH-3	+0.47	—0.46

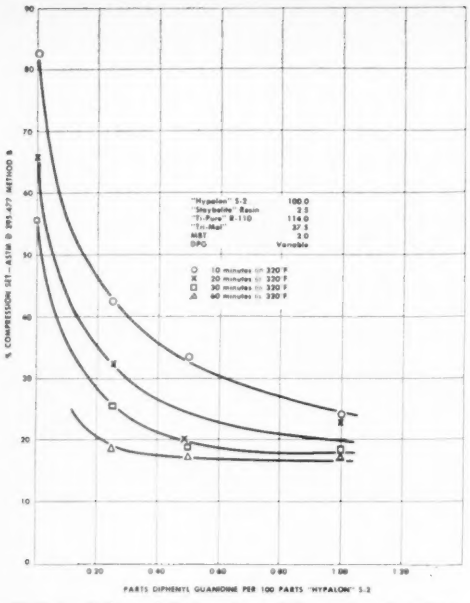

FIG. 5—Effect of diphenylguanidine and curing time on the compression set of Hypalon S-2.

Heat Build-up: When compared with natural rubber, all the Hypalon S-2 stocks tested to date show relatively high heat build-up on flexing in a Goodrich Flexometer. Lowest values have been obtained with stocks cured with magnesium oxide in spite of the fact that such stocks have higher moduli than similar stocks cured with lead oxides. With magnesium oxide and a calcium carbonate filler, recipes have been developed that have heat build-up values intermediate between those of natural rubber and those of GR-S tread stocks. Data showing the heat build-up experienced with various curing agents and fillers are shown in Table XI. Volume loadings were the same for each composition tested, as were the time and temperature of cure.

In black stocks, heat build-up values are of the same order of magnitude as those shown in Table XI. In general, heat build-up increases with increase in filler content and is more or less independent of particle size.

Low Temperature Properties: Complete data on the behavior of Hypalon S-2 compounds at low temperatures are not yet available. It is known, however, that such compositions stiffen considerably when the temperature is lowered, as indicated by torsional methods. Though rather stiff at low temperatures, the compounds are remarkably resistant to cracking upon impact flexing or in mandrel bend tests, if they do not contain more than 25% filler by volume. Compounds loaded only to 10 to 20% by volume have brittleness temperatures in the —65°F. to —80°F. range. At 25% filler by volume there appears to be a rather sharp increase in the brittleness temperature.

Where needed, flexibility at low temperatures can be improved by the addition of plasticizers. Plasticizers also improve the brittleness temperatures of highly loaded stocks, but do not seem to be beneficial in this respect with stocks containing less than 20 per cent filler by volume.

Properties at Elevated Temperatures: At elevated temperatures, the mechanical properties of the compounds compare favorably with those of compounds based on other synthetic elastomers, and in gum stocks or in stocks loaded with fillers other than carbon black, Hypalon S-2 is far superior. Data showing the effects of fillers at various temperatures have been presented in Table III, and some are plotted in Figure 6 to illustrate more clearly the effects of temperature. Again, it is worth noting that Hypalon S-2 is unique in its response to white fillers.

Electrical Properties: The dielectric properties of the elastomer are intermediate between natural rubber and neoprene. Typical wire-coating compositions and their electrical properties are shown in Table XII. It is apparent from these data that Hypalon S-2 should be suitable as an insulation at voltages up to 1000 and perhaps even higher. Wire tests are now in progress to establish its utility as an insulation. The dielectric strength is good, and corona resistance is excellent. Compounds of this type should be highly satisfactory as weather-resistant coverings for many types of insulated wire and cable.

Resistance to Solvents and Chemicals: Table XIII shows the results obtained by immersing Hypalon S-2 compounds in various oils and other liquids. It is evident that the effects vary considerably with composition, and that for this reason it is difficult to make general statements concerning the resistance of Hypalon S-2 stocks to solvents and chemicals, as is the case with most other elastomers. Compared with natural rubber, Hypalon S-2 has good resistance to mineral and vegetable oils. It approximates neoprene in this respect. Dilute sulfuric acid, dilute caustic, ethylene glycol, and methanol have very little effect on it. It has poor resistance to aromatic and chlorinated hydrocarbons; however, in most cases, compounds recover rapidly when they are removed from the immersion media and allowed to stand at room temperature.

Processing Characteristics

Fortunately, the combination of properties just outlined for Hypalon S-2 can be obtained in factory-made products by conventional processing techniques. The processibility of stocks is largely determined by the type and amount of compounding ingredients, as is true with other elastomers. The polymer itself has a Mooney

TABLE XI—HEAT BUILD-UP IN VARIOUS HYPALON S-2 STOCKS

Composition	Curing Agent	Parts Per 100 Parts Hypalon S-2	Volume Per 100 Volumes Hypalon S-2	Filler	Heat Build-up After 20 Minutes (°F.)
1	Litharge	40	4.6	Super Multifex	178
2	Magnesium Oxide	20	6.9	Super Multifex	106
3	Litharge	40	4.6	Celite 270	165
4	Magnesium Oxide	20	6.9	Celite 270	109
5	Tri-Mal	37½	6.9	Titanium Dioxide	180
6	Magnesium Oxide	20	6.9	Titanium Dioxide	106

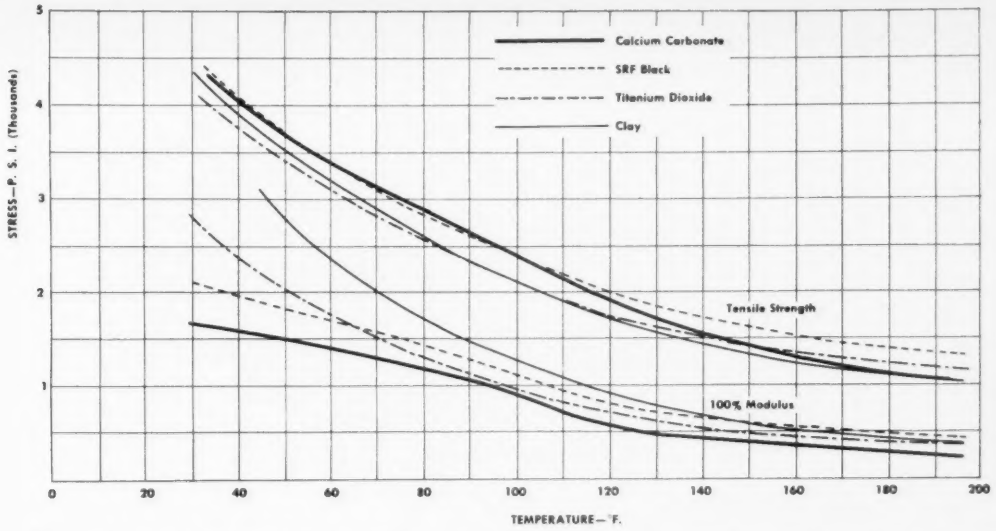

FIG. 6—Effect of temperature on the tensile properties of Hypalon S-2 compounds containing various fillers.

plasticity of about 40 (ML at 212°F. 4 min.), which compares favorably with neoprene, GR-S, and Butyl. Unlike natural rubber, Hypalon S-2 requires no breaking down to achieve uniform plasticity before compounding.

Mixing: In milling Hypalon S-2, roll temperatures of 120°F. or less are used. After the polymer is well banded, the ingredients can be added in any order desired. The stock temperature on the mill varies with the recipe. A recommended maximum is 190°F. If desired, the powdered ingredients can be premixed in a paint mixer, tumbler, rolls, etc., before being added to the polymer. This method does not in any way affect the scorching properties or the ultimate tensile properties of the vulcanizates. Also, it requires less time than that needed for processing other elastomers. Banbury mixing is applicable.

Extrusion: Hypalon S-2 has been extruded in various cross sections with good results. A composition that has been extruded into camelback is shown in Table XIV. This was processed successfully into a smooth strip without any sign of scorching or "feathering" at the edges. It will be noted that this particular compound contains very little filler. Better results are obtained by increasing the loading and/or adding plasticizers such as Circo oil, Kenflex B, boiled linseed oil, di-2-ethylhexyl phthalate, Paraplex G-60, etc. Natural rubber and GR-S are also effective processing aids.

Calendering: Hypalon S-2 compositions have been calendered successfully on laboratory and production calenders. The stock is warmed on a rubber mill before being fed to the calender. The temperature of calendering falls in the range of 140°F. to 230°F., depending on the recipe, with the majority of compositions processing best in the 140°F. to 180°F. range. For best results, a few parts of a release agent such as lead stearate should be added to the recipe. As with other elastomers and plastics, one roll should be slightly warmer than the other so that the stock consistently adheres to the warmer roll. Smooth, even coatings are obtained.

Molding: Hypalon S-2 compounds can be molded readily either by compression or injection. Compression molding and vulcanization appears to provide a perfectly straightforward way of fabricating objects from the polymer. Pressures of 100 to 900 psi have been used

TABLE XII—HYPALON S-2 WIRE COATING COMPOUNDS

Compound Nos.	E-11	E-13	E-16	E-17	E-7
Hypalon S-2	100.0	100.0	100.0	100.0	100.0
Staybelite Resin	2.5	2.5	2.5	2.5	2.5
MBT	3.0	3.0	3.0	3.0	3.0
Litharge	30.0	40.0	40.0	40.0	40.0
Red Ferric Oxide	6.0	—	6.0	6.0	—
Suprex Clay	52.5	56.6	51.0	51.0	—
EPC Black	—	3.0	—	—	34.7
DPG	—	—	—	1.0	—
Light Circo Oil	—	—	15.0	—	—
Mooney Viscosity—MS at 250° F.					
Minimum Reading	22	25	13	57	—
Scorch Time—					
Minutes to 100	30	22	40	9	—
Tensile Strength (psi)	2100	2500	1600	2650	2400
100% Modulus (psi)	1700	2300	1200	2250	1550
Elongation (%)	210	140	160	180	150
Brittle Temperature * (°F.)	—18	—15	—15	—22	—18
Dielectric Constant					
100 Cycles	6.9	7.2	6.4	7.1	13.5
1000 Cycles	6.8	7.0	6.3	6.8	12.9
100 K.C.	6.0	6.2	5.6	5.7	11.0
Dielectric Strength 30-40 mils (Volts per mil)	680	550	620	600	340
Dissipation Factor					
100 Cycles	.02	.02	.02	.03	.03
1000 Cycles	.03	.03	.02	.04	.04
100 K.C.	.08	.07	.07	.08	.09
Volume Resistivity (ohm-cm.)	$>1\times10^{15}$	$>1\times10^{14}$	9.2×10^{13}	3×10^{14}	2.5×10^{12}

* Brittleness temperature can be lowered considerably by reducing the loading.

TABLE XIII—RESISTANCE OF VARIOUS HYPALON S-2 VULCANIZATES TO VARIOUS MATERIALS—ASTM D-471-46T

(Press Cure: 30 Minutes @ 320° F.)

Compound		Immersion Liquid	Conditions Days	°F.	% Change In Tensile Strength	% Change In Elongation	% Change In Volume	% Change In Weight	—% Original After 7 Days at Room Temperature— Tensile Strength	Elongation
M-726		Motor Oil—SAE 10	14	73	—17.2	+12.5	+2.4	+4.2	76	138
Hypalon S-2	100.0		14	158	—46.5	—25.0	+27.9	+21.5	57	113
Staybelite Resin	2.5	Ethylene Glycol	14	73	—3.5	0.0	0.0	+2.7	81	113
Super Multiflex	80.0		14	158	—32.8	—12.5	+6.4	+13.3	77	88
Magnesia	20.0	Cottonseed Oil	14	73	—34.6	+17.5	+11.1	+16.4	64	150
Tetrone A	1.0		14	158	—40.7	—37.5	+54.1	+60.0	32	113
		1 N Sulfuric Acid	14	73	—43.6	+95.0	+4.1	+6.5	67	175
Tensile Strength (p.s.i.)	3460		14	158	—65.3	+55.0	+24.6	+55.6	57	180
100% Modulus (p.s.i.)	1735	1 N Potassium Hydroxide	14	73	—41.5	+87.5	+2.8	+6.0	67	150
Elongation (%)	200		14	158	—69.0	+37.5	+18.0	+20.2	57	175
		Gasoline	14	73	—82.3	—62.5	+60.3	+40.0	64	163
		Xylene	14	73	—100.0	—67.5	+150.8	+119.0	67	200
		Methanol	14	73	—51.2	+57.5	+9.4	+11.3	58	163
		Acetone	14	73	—69.3	+30.0	+27.0	+18.6	63	213
		Carbon Tetrachloride	14	73	—93.5	—37.5	+144.0	+170.0	65	163
M-727		Motor Oil—SAE 10	14	73	—10.8	—6.7	+1.2	+6.3	102	93
Hypalon S-2	100.0		14	158	—60.2	—26.7	+21.5	+25.2	45	78
Wood Resin	10.0	Ethylene Glycol	14	73	+5.8	—6.7	—0.8	+2.6	108	100
Channel Black (EPC)	39.4		14	158	+2.5	+11.1	—0.8	+6.3	97	100
Litharge	40.0	Cottonseed Oil	14	73	—20.4	—6.7	+4.8	+19.4	88	100
MBT	3.0		14	158	—88.3	—33.3	+62.5	+77.6	10	100
		1 N Sulfuric Acid	14	73	—1.2	+4.4	—1.6	+1.4	108	100
Tensile Strength (p.s.i.)	3365		14	158	—0.7	+4.4	—4.3	+3.9	111	89
100% Modulus (p.s.i.)	1375	1 N Potassium Hydroxide	14	73	—6.8	0.0	—0.8	+3.1	114	100
Elongation (%)	225		14	158	—33.8	—11.1	+4.8	+13.3	85	89
		Gasoline	14	73	—89.8	—48.9	+84.2	+45.3	75	100
		Xylene	14	73	—100.0	—100.0	+158.8	+129.0	82	89
		Methanol	14	73	—31.4	+6.7	0.0	+4.1	99	100
		Acetone	14	73	—78.0	—33.3	+18.4	+17.6	94	100
		Carbon Tetrachloride	14	73	—94.3	—66.7	+136.4	+204.0	81	93
M-740		Motor Oil—SAE 10	14	73	—2.7	—5.7	+1.6	+39.4	85	100
Hypalon S-2	100.0		14	158	—45.7	—8.6	+18.0	+81.2	45	86
Staybelite Resin	2.5	Ethylene Glycol	14	73	+13.1	—8.6	—0.8	+2.0	98	92
Suprex Clay	69.5		14	158	—15.4	+51.4	—0.8	+18.0	71	157
Tri-Mal	37.5	Cottonseed Oil	14	73	—19.1	+14.3	+3.2	+70.0	72	114
MBT	3.0		14	158	—73.7	+65.6	+40.2	+173.0	22	143
		1 N Sulfuric Acid	14	73	—15.7	+42.8	—0.8	+1.6	94	100
Tensile Strength (p.s.i.)	2640		14	158	—18.2	+57.1	—0.8	+2.2	96	114
100% Modulus (p.s.i.)	2180	1 N Potassium Hydroxide	14	73	—16.3	+42.8	—0.4	+2.2	89	114
Elongation (%)	175		14	158	—13.8	+57.1	—0.8	+2.3	89	157
		Gasoline	14	73	—76.2	—22.8	+57.3	+41.3	68	100
		Xylene	14	73	—88.3	—100.0	——	+110.0	80	80
		Methanol	14	73	—39.0	+57.1	0.0	+2.1	75	114
		Acetone	14	73	—61.2	+28.6	+17.5	+14.7	78	114
		Carbon Tetrachloride	14	73	—82.8	—28.6	+119.0	+176.0	—	91
M-773		Motor Oil—SAE 10	14	73	—29.1	—17.0	+0.4	+3.2	83	89
Hypalon S-2	100.0		14	158	—73.8	—44.6	+4.3	+13.6	39	71
Staybelite Resin	2.5	Ethylene Glycol	14	73	+7.2	—6.3	—0.8	+2.2	97	94
Tri-Mal	33.0		14	158	—8.8	—8.9	—0.8	+3.4	72	80
MBT	3.0	Cottonseed Oil	14	73	—61.7	—35.8	+4.0	+4.4	57	80
			14	158	—92.9	—57.1	+22.9	+20.6	9	49
Tensile Strength (p.s.i.)	2575	1 N Sulfuric Acid	14	73	—25.2	—3.6	—1.6	+2.2	97	98
100% Modulus (p.s.i.)	200		14	158	—20.8	—8.9	—1.2	+2.6	98	80
Elongation (%)	560	1 N Potassium Hydroxide	14	73	—22.7	—1.8	—0.4	+1.3	79	85
			14	158	—17.1	—15.2	—2.0	+2.4	98	76
		Gasoline	14	73	—97.2	—66.9	+148.0	+76.6	52	76
		Xylene	14	73	—100.0	—73.7	+392.0	+241.0	73	89
		Methanol	14	73	—35.4	—1.8	0.0	—1.8	89	94
		Acetone	14	73	—86.9	—49.0	+33.0	+24.0	81	89
		Carbon Tetrachloride	14	73	—98.3	—86.6	+322.0	+382.0	56	76
M-787		Motor Oil—SAE 10	14	73	—4.1	—8.8	+1.2	+3.2	77	97
Hypalon S-2	100.0		14	158	—36.0	—21.0	+2.0	+6.5	50	97
Staybelite Resin	2.5	Ethylene Glycol	14	73	+9.7	—21.0	—0.8	+6.6	93	97
Iceberg Pigment	70.5		14	158	—9.2	+40.4	—2.4	+8.3	80	140
Tri-Mal	37.5	Cottonseed Oil	14	73	—19.8	+5.3	+1.2	+4.9	77	105
MBT	3.0		14	158	—59.3	—22.8	+53.6	+38.2	27	114
		1 N Sulfuric Acid	14	73	—13.0	+17.5	—1.2	+5.6	91	93
Tensile Strength (p.s.i.)	1695		14	158	—9.4	+10.5	—1.2	+3.5	99	97
100% Modulus (p.s.i.)	1330	1 N Potassium Hydroxide	14	73	—13.9	+5.3	—0.4	+6.0	86	91
Elongation (%)	285		14	158	—28.3	+5.3	+2.0	+3.8	93	91
		Gasoline	14	73	—77.8	—29.8	+77.6	+48.5	75	70
		Xylene	14	73	—89.7	—47.4	+160.2	+115.0	83	91
		Methanol	14	73	—22.5	+22.8	0.0	+6.2	83	105
		Acetone	14	73	—59.6	—8.8	+22.0	+15.0	80	105
		Carbon Tetrachloride	14	73	—86.1	—56.1	+151.6	+172.0	77	79

successfully, and pressure does not seem to be important unless there are unusually sharp or critical contours where flow is a serious consideration.

With normal acceleration, a 30-minute cure at 320°F. gives good results for thicknesses of 40 to 500 mils. Shorter molding cycles are obtained by supplementary acceleration with diphenylguanidine or with sodium acetate. Preliminary tests have shown that a 5-minute cycle at 300°F. can be achieved in this manner with 0.1 to 0.5 parts of DPG or sodium acetate.

Compounds have been molded in a Monroe injection machine. If DPG or sodium acetate are used as supplementary accelerators and the die is maintained at 320°F. to 350°F., a cycle as short as one minute is possible.

As a mold release agent, a mixture consisting of 28 grams of Aquarex D and 115 grams of DC-35 in one gallon of distilled water is suggested. This solution may be sprayed liberally on the hot molds before the stock is introduced.

Curing: Hypalon S-2 is cured by conventional methods. Under pressures of 100 to 900 psi, excellent results are obtained in 15 minutes to 2 hours at 260°F. to 320°F. Overcuring is not much of a problem since additional curing time neither improves nor harms the final physical properties appreciably. Figures 7 and 8 show the effect of curing time on the tensile properties of some of the compositions listed in Table VIII.

Steam curing is particularly effective for the compounds since water acts as a catalyst in the curing reaction. Excellent results are obtained in a matter of minutes or seconds with open-steam or steam-laden air. Higher steam temperatures result in faster cures. This method is recommended wherever possible for use with thin sections.

Oven curing is another satisfactory method, although it is by necessity much slower than press curing or steam curing. Lower temperatures must be used to preclude the loss of water (essential to cure) and possible pyrolysis with loss of SO_2. Excellent results are obtained in four hours at 250°F. to 280°F.

Blends with Other Elastomers

From the remarks and data presented thus far, it is apparent that Hypalon S-2 offers many opportunities in the rubber industry as a new elastomer with an excellent combination of properties obtainable through practical compounding and processing techniques. There is little doubt that it will be used as such in many applications. Also of interest to the rubber compounder is its use in blends with other elastomers.

A considerable amount of exploratory work has been done with blends of Hypalon S-2 with natural rubber, GR-S, Butyl, nitrile rubbers, and with neoprene. Typical examples of such compounds are shown in Table XV, and their properties are outlined in Table XVI.

Without question, the most significant result of this investigation has been the discovery that the addition of Hypalon S-2 to any of the other elastomers results in remarkable improvement in resistance to ozone. Essentially complete ozone resistance (no cracking of stressed samples after 2 hours' exposure to 150 p.p.m. ozone) is accomplished with a Hypalon S-2 concentration of 50 per cent, and sometimes with as low as 20 per cent concentration. Dynamic and static tests show similar results. The addition of less than 10 per cent seldom improves ozone resistance. As the concentration of Hypalon S-2 is increased, cracks from ozone attack become less numerous but deeper, until finally they fail to appear entirely at concentrations between 20 and 50 per cent.

TABLE XIV—HYPALON S-2 CAMELBACK STOCK

(Parts by Weight)

Hypalon S-2	100.0
Staybelite Resin	2.5
Litharge	40.0
MBT	3.0
SRF Black	12.5
Cure: 30 Minutes @ 320° F.	
Tensile Strength (psi)	2550
100% Modulus (psi)	810
Elongation (%)	350
Shore Hardness (A)	72

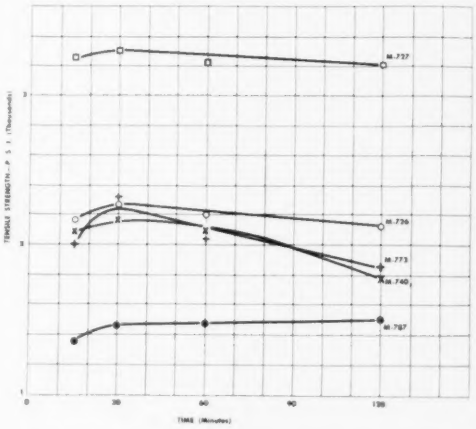

FIG. 7—Effect of curing time on tensile strength of Hypalon S-2 vulcanizates press cured at 320°F.

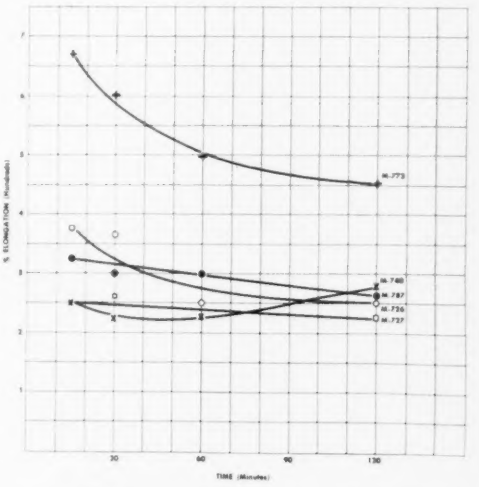

FIG. 8—Effect of curing time on elongation of Hypalon S-2 vulcanizates press cured at 320°F.

TABLE XV—EXAMPLES OF BLENDS OF HYPALON S-2 WITH OTHER ELASTOMERS

R-234		R-122		G-4050		R-92	
Blend with Natural Rubber		Blend with Butyl Rubber		Blend with Nitrile Rubber		Blend with Neoprene	
Hypalon S-2	55.00	Hypalon S-2	12.0	Hypalon S-2	55.00	Hypalon S-2	50.00
Natural Rubber	45.00	GR-I	88.0	Hycar OR-15	50.00	Neoprene W	50.00
Staybelite Resin	1.40	Stearic Acid	2.8	Magnesium Oxide	11.00	Staybelite Resin	1.25
Tri-Mal	20.60	Staybelite Resin	0.3	Zinc Oxide	2.50	Stearic Acid	0.25
Sulfur	0.45	Tri-Mal	4.5	MAF Black	33.00	Tri-Mal	19.00
MBT	1.65	EPC Black	38.0	Sulfur	0.75	Zinc Oxide	2.50
DPG	0.14	Zinc Oxide	4.4	MBTS	2.40	Magnesium Oxide	2.00
AgeRite Resin D	1.80	Sulfur	1.8	Staybelite Resin	1.40	Neozone A	1.00
		Thuram M	0.9			NA-22	0.25
		MBT	0.8			MBT	1.50
						DPG	0.12

	Blends with GR-S				
	R-333	R-335	R-361	01-136B	19-37C
Hypalon S-2	25.0	25.0	25.0	25.0	25.00
GR-S X-630	75.0	75.0	—	75.0	—
GR-S 101	—	—	75.0	—	75.00
Stearic Acid	1.0	1.0	1.0	1.0	1.00
Litharge	15.0	15.0	15.0	15.0	15.00
Sulfur	1.5	1.5	1.5	1.5	0.75
MBTS	1.0	1.0	1.0	1.0	1.00
AgeRite Stalite	1.0	1.0	1.0	1.0	1.00
AgeRite Resin D	1.0	1.0	1.0	1.0	1.00
SRF Black	34.0	—	—	—	—
EPC Black	—	—	—	34.0	34.00
HAF Black	—	34.0	34.0	—	—

The end-point probably depends to some extent on the degree of mixing and on formulation. In compounds of borderline resistance, ozone attack appears most severe at points of high stress, thus tending to continue a crack or cut that has been otherwise initiated at the point of stress.

Other characteristic properties of the new elastomer are usually reflected in the properties of blends. Resistance to abrasion is generally improved, perhaps as a result of higher modulus and hardness. Properly compounded stocks show improved resistance to heat and water. To obtain best heat resistance, it is desirable to avoid the use of zinc compounds and at the same time use a suitable metal oxide, such as litharge, or another type of acid acceptor. Litharge has proved to be an invaluable aid in compounding for maximum resistance to heat and water.

Although experiments to date have been preliminary in nature, it is apparent that the new material can contribute significantly to the durability of other elastomers. Looking at such systems in another light, it is also apparent that the other elastomers can contribute significantly to Hypalon S-2 as softeners, processing aids, and tackifiers, as well as in other ways. For this reason, it is worth while to consider each system separately and the benefits that each elastomer contributes to the other.

Blends with Natural Rubber: In addition to giving marked improvements in resistance to ozone and abrasion, Hypalon S-2, when blended with natural rubber, improves oil resistance and results in increases in hardness, stiffness, and modulus. Decreases occur in water absorption and elongation. The brittleness temperature remains about the same. Compression set does not increase appreciably until more than 75 per cent Hypalon S-2 is present. Heat aging is improved if the use of zinc oxide is avoided.

Natural rubber is an excellent softener and processing aid for Hypalon S-2. As mentioned before, approximately the lowest hardness obtainable in the new elastomer without the use of plasticizers is 60, measured on the Shore Durometer A scale. This hardness can be decreased 10 to 15 points by using natural rubber as the softener. Blends process more smoothly than do all-Hypalon S-2 compounds. In addition, natural rubber contributes building tack and improves compression set.

Blends with Butyl: Butyl rubber has good ozone resistance, but Hypalon S-2 blended with it improves this property. Use of Hypalon S-2 also brings improved resistance to abrasion and heat. The use of as little as 10 per cent results in a several-fold increase in modulus and a marked increase in hardness, without serious loss in elongation. The use of more than 40 per cent decreases the elongation to less than 200 per cent. The compression set of Butyl is not increased appreciably as the Hypalon S-2 is increased until more than 60 per cent has been added.

Blends with Nitrile Rubbers: Preliminary work with this system has been done with nitrile rubber of high acrylonitrile content. Blends of this type possess a combination of oil resistance, ozone resistance, and good low temperature brittleness without the use of plasticizers. If no more than 35 to 50 per cent Hypalon S-2 is used, the oil resistance of such a blend approaches that of the nitrile rubber itself, and the blend is resistant to ozone. Also, at this same level, flexibility at —65°F. can be obtained without the use of plasticizers by keeping the filler content low. Thus it is apparent that Hypalon S-2 can be used as a flexible reinforcing agent for the nitrile rubbers.

Blends with GR-S: Resistance to ozone in blends of Hypalon S-2 with GR-S occurs at a lower Hypalon S-2 content (25 per cent) than it does in the other elastomers. Further research may show how to equal these results in the other systems. It is known that good dispersion is required in Hypalon S-2—GR-S blends in order to obtain maximum resistance to ozone. It is also known that the type of loading is important in determining the resistance to abrasion and crack-growth. No definite conclusions can be made at this time as to optimum formulation. It is interesting to note from results shown

TABLE XVI—PROPERTIES OF BLENDS OF HYPALON S-2 WITH OTHER ELASTOMERS

Composition	R-234	R-122	G-4050	01-136B	R-333	R-335	R-361	19-37C	R-92
Hypalon S-2 Content, % of total elastomer	50	10	50	25	25	25	25	25	50
Other Elastomer	Nat'l. Rubber	GR-I	Hycar OR-15	GR-S (X-630)	GR-S (X-630)	GR-S (X-630)	Cold GR-S 101	Cold GR-S 101	Neoprene
Filler Type	—	EPC Black	MAF Black	EPC Black	SRF Black	HAF Black	HAF Black	EPC Black	—
Filler Loading, Parts/100 total elastomer	None	38	33	34	34	34	34	34	None
Curing Time (optimum, mins.)	15	30	60	30	15	30	15	15	15
Curing Temperature (°F.)	307	307	307	300	300	300	300	300	307
Initial Properties									
Tensile Strength (p.s.i.)	2275	2100	2960	2100	1725	2110	2470	2540	2050
Modulus (100%) (p.s.i.)	200	300	1240	630	410	500	600	670	600(300%)
Elongation (%)	500	680	220	290	315	300	300	355	600
Residual Elongation (%)	10	30	10	13	10	10	5	10	—
Shore Durometer Hardness (A-C)	48–15	63–29	76–43	61–25	57–23	61–27	63–29	68–32	46–
Compression Set (%) (22 hrs. at 70° C.), Method B	26	23	—	19	—	—	—	—	49
Tinius-Olsen Stiffness (p.s.i.)	284	1232	1260	900	670	960	900	900	—
Crack Growth (kilocycles to 1" break)	—	—	—	4	400	25	2	33	—
Abrasion Loss (DuPont) (cc./h.p. hr.)	—	114	—	9	79	21	32	10	—
Ozone Resistance (150 p.p.m.) (mins. to failure)	O.K. after 120	O.K. after 840	O.K. after 95	O.K. after 120	—	—	—	O.K. after 120	O.K. after 120
Aged Properties									
7 Days at 212° F.—Tensile Strength (p.s.i.)	870	—	3755	2100	1560	2000	—	2260	—
Elongation (%)	280	—	130	215	210	225	—	260	—
Shore Durometer Hardness (C)	16	—	60	33	27	31	—	35	—
Tinius-Olsen Stiffness (p.s.i.)	161	—	1,880	790	580	770	—	900	—
14 Days at 212° F.—Tensile Strength (p.s.i.)	—	—	—	1800	—	—	—	—	—
Elongation (%)	—	—	—	175	—	—	—	—	—
Shore Durometer Hardness (C)	—	—	—	38	—	—	—	—	—
Tinius-Olsen Stiffness (p.s.i.)	—	—	—	820	—	—	—	—	—
7 Days at 257° F.—Tensile Strength (p.s.i.)	1050	1500	—	—	—	—	—	—	—
Elongation (%)	35	290	—	—	—	—	—	—	—
Shore Durometer Hardness (C)	42	51	—	—	—	—	—	—	—
Tinius-Olsen Stiffness (p.s.i.)	15,000	4,000	—	—	—	—	—	—	—
Oxygen Bomb, 28 Days at 158° F., 300 p.s.i.—									
Tensile Strength (p.s.i.)	1100	1350	3046	—	—	—	—	—	—
Elongation (%)	280	430	193	—	—	—	—	—	—

in Table XVI, however, that if SRF black is used as the filler, Hypalon S-2 improves the resistance of GR-S to crack-growth.

Hypalon S-2 reduces the elongation of GR-S rather sharply, but enables the compounds to retain most of this elongation upon heat aging. Also, on heat aging, tensile strength is retained more effectively, and hardness and stiffness do not increase as much as with an all-GR-S compound. It is predicted that such blends will weather better than GR-S, although tests have not yet been completed. The use of litharge as the curing agent and acid acceptor, replacing the conventional zinc oxide, has thus far been found necessary for good aging properties.

GR-S is a good processing aid for Hypalon S-2, although not as effective as natural rubber. It is very effective as an additive for decreasing the compression set and shows some promise of improving the low temperature properties of filled compositions.

Blends with Neoprene: Neoprene has excellent resistance to ozone when properly compounded, and this property has proved very useful over a period of years. It can be improved considerably in this respect, however, through the addition of Hypalon S-2. Furthermore, marked improvements in abrasion resistance result. The brittleness temperature is lowered to some extent, hardness and modulus are increased, elongation is decreased, and compression set is increased sharply. The oil resistance of such blends is not quite as good as that of neoprene alone.

Typical Applications

It is not surprising, in view of its complete resistance to ozone, its ability to contribute this property to other elastomers, and its other excellent attributes, that Hypalon S-2 is being examined very critically for many applications, in spite of the fact it is not yet available in large commercial quantities. Significant progress has been made in the uses discussed below.

Tire Treads: Hypalon S-2 stocks such as that shown in Table XIV have been used for the experimental retreading of tires, and many tests are either planned or are now under way. Although far from conclusive as yet, these tests indicate that road wear is as good as that of cold GR-S. In processing, these stocks have no building tack and are considerably stiffer than natural rubber or GR-S. Special adhesives must be used, and although they are available, splicing difficulties in tread application are anticipated.

Progress in the use of Hypalon S-2 in tread stocks is being made through blends of this new elastomer with GR-S. As was discussed previously, the addition of a minimum of 25% Hypalon S-2 to GR-S results in almost complete protection against ozone, with what appears to be a marked improvement in abrasion resistance and aging characteristics. There appears to be very little difference in the processing characteristics of this blend and those of regular GR-S tread stocks.

The use of the new elastomer in colored tires is another interesting possibility. Retreads have already been made and are under test. Results to date show that such stocks wear as well as black stocks, thus substantiating the laboratory data which showed that carbon black is not required in Hypalon S-2 to obtain satisfactory physical properties.

White Sidewalls: One of the best possible uses for the new elastomer appears to be in white sidewall tires. It is very likely that through the use of Hypalon S-2, white sidewall tires can be made which are far superior to present black tires. This belief is based on improvement in resistance to ozone, weather, flex-cracking, abrasion, and discoloration. The problems involved in the use of such stocks are adhesion to the carcass and sensitivity to discoloration from staining type antioxidants. Satisfactory adhesives have been found and experimental tires will be made using non-staining type antioxidants in carcass and tread.

In other tests, Hypalon S-2 will be tried in blends with natural rubber, natural rubber and neoprene, GR-S, and Butyl. The advantage anticipated in the blend route is attainment of essentially complete resistance to ozone by means of processing techniques similar to those now used.

Tire Paints: Hypalon S-2 has possibilities in white sidewall paints and in black paints for protecting tires from ozone attack during use or in storage. With white paints the antioxidant staining problem exists, and such paints can be used only over rubber containing special non-staining antioxidants or no antioxidants. With either black or white paints, adhesion appears adequate, film strength is excellent, and scuff resistance is good. Films of Hypalon S-2 as thin as 0.001-inch will provide complete ozone protection to rubber if the coating is continuous.

Inner Tubes: The new elastomer is being considered as a modifier for Butyl rubber in tubes. Its ability to increase the modulus of Butyl when added in small quantities may prove to be useful in preventing or decreasing the tendency of such tubes to "grow" and overlap under certain conditions.

Sponge Weather Stripping: Hypalon S-2 shows promise of eliminating the ozone cracking problem that exists with sponge weather stripping. GR-S is now used as the dense cover for these sponge strips used in automobiles. Wherever such strips are bent around corners ozone will attack and cause severe cracking within a short time. Hypalon S-2 in blends with GR-S is now being tried in this application with most encouraging results.

Another approach to solving this problem is being made by using Hypalon S-2 paints.

Window Channels and Ventilator Strips: The use of Hypalon S-2 or compounds of this new material with GR-S offer the opportunity of providing ozone-resistant automobile window channels and ventilator strips. It may be necessary to use softeners with such compounds in order to obtain the proper hardness for sealing.

Coated Fabrics: Unusually durable and leather-like coated fabrics in many colors have been made from Hypalon S-2 stocks. Such fabrics appear to be ideal for heavy-duty applications of many types, either indoors or outdoors. Gratifying results have been obtained in tests on amusement park equipment, motorboats, buses, trucks, tractor seats, lawn furniture, etc. The coatings used in these tests were applied by calendering, although excellent results have also been obtained by spreading with solutions. Plasticizers are not necessary.

Footwear: Because it can be compounded in a wide variety of colors without sacrificing physical properties, Hypalon S-2 has interesting possibilities for use in colored footwear. In addition, it has proven effective in blends with natural rubber for use in boots. In this latter use it prevents ozone cracking. The rubber contributes sufficient tack so that adhesives are not needed. It is also being tried in colored footwear finishes.

Mats: Hypalon S-2 blended with GR-S has been tested in colored floor mats. It contributes definite improvement in color, surface hardness and gloss, abrasion resistance, and grease resistance.

Floor Tile: An experimental floor tile installation after three years of service, shows that Hypalon S-2 is su-

perior to rubber and plastic tile in resisting wear, scratching, scuffing, and indentation. Dimensional stability is excellent, and resistance to cleaning agents and common solvents is good. The color range is excellent. If cured with litharge, the water resistance is very satisfactory; this property, in combination with its good alkali resistance, suggests use on concrete floors-above-grade, on-grade, and possibly below-grade. Its resistance to heat would be of benefit where floor-type radiant heating is used. Another interesting possibility is the use of Hypalon S-2 tile on outdoor porches, terraces, and decks.

Ignition Systems: The new elastomer has excellent corona resistance, good heat aging properties, and a fair degree of oil resistance. This combination of properties has led to trials in distributor boots, spark plug covers, and ignition wire jacketing. Results are very promising.

Gaskets: The compression set characteristics of Hypalon S-2 are very favorable in blends with GR-S, natural rubber, and the nitrile rubbers. This advantage, it is believed, will lead to its use in gaskets where resistance to ozone, heat, or weather is important. Such combinations should be of particular interest for refrigerators, aircraft, and ship hatches. Since it is considerably harder than other elastomers, it offers a combination of high hardness and resilience. It will doubtless be useful in many gasket applications where such a combination of properties is needed.

Hose: Hypalon S-2 has been used in factory trials for making high pressure steam hose and as a cover for water hose. Other types of hose have also been made in smaller scale tests. It should be ideal as a garden hose and as an industrial water hose cover because of its outstanding resistance to ozone, weather, and abrasion, in addition to its fine color possibilities. Such hose has been made by standard lead press techniques. Besides its use in conventional hose reinforced with braid, there is a strong likelihood that Hypalon S-2 will be satisfactory in unsupported garden hose because of its high modulus. Its resistance to abrasion, water, and chemicals suggests applications in rotary drilling hose for oil wells.

Belting: To date, very little has been done with Hypalon S-2 in belting. Its inherent lack of building tack and the need for an adhesive in bonding it to other elastomers has proved troublesome. Satisfactory adhesives are now available. It is expected that improved flex-life and resistance to heat, ozone, and abrasion will prove highly useful in many belting applications. This probability has been demonstrated in one application involving a fabric conveyor belt coated with a Hypalon S-2 cement.

Wire and Cable: The new elastomer extrudes very smoothly onto wire at good rates and can be cured in continuous vulcanization equipment. Its inherent resistance to ozone and excellent weatherability in combination with good low temperature properties make diverse application in the wire and cable field attractive, such as in appliance cord, ignition wire, low temperature jackets, weatherproof wire of several types, and a combination insulation-jacket for low-voltage power transmission.

Summary

Hypalon S-2 chlorosulfonated polythene, one of the most durable elastomers ever offered to the rubber industry, is now being made in pilot-plant quantities by the Polychemicals Department of the DuPont Company. It can be processed with conventional rubber machinery and cured into products that combine complete resistance to ozone; excellent resistance to abrasion, heat, sunlight, and weather; unusually good flex-life and resistance to crack-growth; low water absorption; good low temperature properties without plasticizers, and a wide color range. It is apparent from preliminary compounding studies that it can be blended with natural rubber, GR-S, Butyl, nitrile rubbers, and neoprene to form compounds that are outstanding in ozone resistance, generally superior in resistance to abrasion, and usefully modified in other respects.

Special techniques can be used with this new elastomer to overcome its tendency toward high heat build-up and compression set. Adhesives are available for use in building and bonding. Although it does not process as smoothly as natural rubber, it can be handled satisfactorily in conventional factory processes.

It is evident from application research performed to date that Hypalon S-2 will find its way into many rubber products. Excellent progress is being made in adapting it for use in tire treads, white sidewalls, weather stripping, coated fabrics, footwear, floor mats, hose, wire and cable, protective coatings for rubber, and in many other rubber products.

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Ameran CV-G Polyvinyl Compounds

SEVERAL new compounds which are said to offer new possibilities for the manufacture of plastic products through the use of simple techniques and modest processing equipment are now being marketed by American Anode, Inc., Akron, Ohio. Called Ameran CV-G Compounds, they consist of polyvinyl chloride resin dispersions incorporating gelling agents which yield a putty-like mass, the form in which they are used for conversion into finished goods.

At room temperatures, the plastic mass may be formed by hand, sheeted or extruded, stamped or pressed into any desired shape. Good dimensional stability and any imparted surface detail are retained during the heat treament required to yield a finished plastic article. According to American Anode, only a few minutes exposure to 350°F. will completely fuse the plastic, producing a tough, flexible finished article having all the desirable chemical resistivity characteristics of conventionally processed polyvinyl chloride resins.

Hardnesses of the Ameran CV-G Compounds range from 35 to 95, depending upon the type of formulation. Tensile strength of the films range from 2000 to 3000 pounds per square inch at elongations of 200 to 450%. Chemical resistance values can be modified by selection of plasticizers and pigments used in compounding. Any color can be produced, including white.

Production of Expanded Unicellular Polyvinyl Chloride

INCREASING applications in military and industrial fields are being found for vinyl sponge, such as Spongex Plastic made by the Sponge Rubber Products Co. of Shelton, Conn. This material, an expanded unicellular polyvinyl chloride, was developed by the company based on German patents made available to industry after World War II by the Alien Property Custodian. It has sealed off gas-filled cells, giving the product extreme resiliency and buoyancy.

According to information supplied by the B. F. Goodrich Chemical Co., to make the closed cell plastic a plastisol is formulated from Geon paste resin to which is added various pigments. The plastisol is then ground together with a nitrogen blowing agent on an ink mill. The mixture is then poured into a mold and heat applied. The heating performs two functions: first, it fuses the plastisol, and second, it decomposes the blowing agent, liberating nitrogen gas within the plastic. The gas formed applies expansive pressure against the walls of small cells.

The type of mold used determines the amount of expansion. If an oversize (low pressure) mold is used, the material tends to expand to approximately 10 times its original volume, the mass almost completely filling the mold in taking its ultimate shape. When an undersize (high pressure) mold is used, the material is confined throughout the fusing stage to a fraction of its final size. The plastisol is chilled before removal from the mold, and is warmed to the point of softening. At this point the small object expands uniformly to obtain its final shape. If the plastisol mixture described were blown against atmospheric pressure (without using a mold) the result would be an open cell, or connecting cell, sponge which would absorb liquid in a manner similar to natural sea sponges.

Vinyl sponge will stand the effects of weathering, drastic temperature changes, oils, greases, solvents, and abrasion without becoming brittle or deteriorated as would ordinary rubber. It will not support fire. Because of these qualities it is finding wide application in military products. For example, large quantities of vinyl sponge sheeting are being used in lining military vehicle cabs. In this application the plastic insulation properties are such that the cab stays warm with a minimum of heat and, at the same time, is rendered practically soundproof by the ¼-inch sheeting.

Sponge Rubber Products is also supplying 25-man life rafts of vinyl sponge to the Navy. The rafts are very light and buoyant and cannot be harmed by ozone or fungus growth. Gunfire shrapnel cannot sink the rafts, as could be the case if a hollow metal or plastic were used. One test conducted to measure the abrasion resistance is to weight a float down with 100 pounds and drag it over 300 feet of concrete. In such a test the surface is slightly scuffed, but the performance of the raft is in no way affected.

Among industrial products made from the expanded unicellular material are fish net floats and x-ray head cushions for use on dentists' chairs. The material used in the fish net floats is compounded especially for weather resistance, light weight and maximum toughness. After 24 hours at a pressure equivalent to 75 fathoms of water, water absorption is less than 2% by weight. The floats range in size from 3½ by 6 inches to 6 by 14 inches. The x-ray head cushions are said to be very soft and pleasing to the touch, to resist any oil that may be on the patient's hair or skin, and to cast no image on the x-ray negative.

In general, expanded unicellular materials made from Geon polyvinyl chloride resin have excellent thermal and electrical insulating properties, are extremely tough and resistant to shock, will not support combustion, and, if properly compounded, will not support mould or bacteria growth.

Method of Determining Proper Lubrication for Machinery

A QUESTION frequently asked by operators of rubber plants is: "How can I be sure that I am using the right amount of oil in my equipment?" The answer too often is so complex that it cannot be properly understood and, in fact, in many instances the oil salesman himself doesn't know the answer.

The "stopping time test" is an excellent one for determining proper lubrication. The test is very simple. For instance, if you wish to determine whether or not a given steam engine is properly lubricated, just pull out your watch and take the time required for the engine to come to a stop after shutting off the steam. The longer the stopping time the better.

It is plain that if a flywheel weighs, say, 2000 pounds, it has a definite amount of energy stored in it when running at normal speed. Therefore, when steam is suddenly shut off, an equal amount of energy is dissipated every time the engine stops. With all conditions the same, an exactly identical length of time will be consumed in stopping every time the throttle is closed. By noting the stopping time every night and by altering the quantity of lubricant fed to the engine every day, the proper quality and amount of lubricant can easily be determined in a period of time. If the engine drives machinery, as engines generally do, try the stopping time test with and without the load. With the load the stopping time, of course, is much less than without the load.

Motor-driven, diesel engine-driven, and turbine-driven rubber mills can often be tested in the same way. The flywheel effect of pulleys on line shafts and on the machinery itself is sometimes sufficient to cause the machinery to operate for some time after the power is shut off. It is logical that as long as there is a difference in stopping time, all other conditions being the same, there is a difference in lubrication. The thing to do is to make the stopping time as long as possible.

W. F. S.

Code and Specifications for Identification of Plasticizers from Petroleum

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THE purpose of this paper is to suggest specifications and a code of symbols based on these specifications which will enable both suppliers and consumers of petroleum products used in compounding rubber to standardize on specifications and to simplify nomenclature. The chaos existing in the present nomenclature of plasticizers is appalling.

The advantages of definitive specifications and uniform nomenclature are so evident that a discussion of their value appears unnecessary. The very existence of the American Society for Testing Materials and its phenomenal growth are sufficient proof of this fact.

The specifications and symbols proposed in this paper have been designed to eliminate the existing confusion regarding petroleum products of high boiling range. They are so chosen as to assure uniformity in composition and reproducibility of results, and to define equivalent products.

Carbon Black Symbols as a Precedent

An excellent example of voluntary cooperation aimed at establishing uniformity in nomenclature was given by the carbon black industry during the last war when the creation of a uniform carbon black nomenclature was advocated by the Office of the Rubber Director *(1-4)*. The symbols suggested were quickly accepted by both suppliers and consumers and the designations SRF, EPC, MPC, HMF, etc., are now in general use, together with new symbols which are being added to the original list as new types of blacks appear on the market.

The symbols used for the various types of carbon black are made up from initials standing for performance and origin of the black. For instance, SRF for *S*emi-*R*einforcing *F*urnace Black and EPC for *E*asy *P*rocessing Channel Black define the blacks rather well, especially since the carbon black industry has followed the policy of revealing manufacturing processes used and characteristics of the various types of black.

For a number of reasons as simple a code as that used for carbon blacks does not seem feasible for petroleum products. It will suffice to point out a few distinct differences between products from the carbon black industry and products from the petroleum industry used in rubber compounding, as follows:

(a) While the carbon blacks used as fillers by the rubber industry are produced in plants specially designed for their manufacture, petroleum products used by the rubber industry are by-products, or originate from by-products, made in refineries which have been designed and are run primarily to produce other products. The similarity in manufacturing procedures and purposes of carbon black plants, although operated by different companies, make standardization on the basis of production relatively easy. This is not possible with petroleum products.

(b) There is less agreement regarding typical functions of petroleum products in rubber than there is regarding functions of various types of carbon black.

(c) In distinction to carbon black, which is chemically predominantly carbon, petroleum products are complex mixtures of many thousands of compounds which can scarcely be identified by symbols denoting performance and origin.

It appears, therefore, that a more detailed code based on chemical make-up is indicated for petroleum products. The petroleum industry has, so far, relied primarily on physical characteristics to define and test petroleum products; chemical tests are used principally to guard against undesirable impurities. This is understandable since the bulk of petroleum products manufactured is for use as fuels or in applications where physical characteristics are deciding factors. These facts have been pointed out by a number of authors. A critical discussion of testing petroleum products has, for instance, been published by A.S.T.M. Committee D-2 on Petroleum Products and Lubricants *(5)*. A general description of petroleum products, their specifications and manufacture, with reference to application in rubber compounding, has also been published *(6)*.

Analytical Basis for Specifications and Code

The need for defining petroleum products by chemical characteristics has been recognized for some time, and extensive work has been carried out on composition of petroleum products and on correlation of composition with performance in rubber. This work resulted in the development of a quantitative analysis, referred to as group analysis. It was shown that petroleum products used in compounding rubber consist of certain basic groups of components which are responsible for performance *(7, 8)*. A recent paper reported a method of determination of hydrocarbon type, which determination supplements the above-mentioned group analysis, identifying oils as paraffinic or naphthenic *(9)*. The specifications and code suggested in the present paper are based on this work.

Briefly summarized, it has been shown that every petroleum product can be defined and identified by its viscosity, the percentage composition of the five basic groups of components, and the hydrocarbon type. Essentially, the influence of these variables on the properties of rubber compounds are as follows:

Viscosity: This property is a measure of average molecular weight of the plasticizer. The principal influence of viscosity of a plasticizer on the vulcanizate is in modulus. The higher the viscosity of a plasticizer, the lower will be the modulus of the compound.

Asphaltenes: (Component insoluble in n-pentane). The presence of asphaltenes is indicative of non-distilled components. The principal influence is stiffening of the stock. Asphaltenes are the characteristic component of gilsonite, blown petroleum asphalts, and distillation resi-

TABLE I—CODE AND SPECIFICATIONS CHART FOR PETROLEUM PRODUCTS FOR RUBBER

Viscosity in cP @ 25° C.	Low	Medium Low	Medium	Medium High	High
	L	m / l	M	m / h	H
	<500	500-5000	5001-20,000	20,001-50,000	>50,000
Product Type	Asphaltic	Asphaltic-Resinous	Resinous	Asphaltic-Oily	Oily
	A	a / r	R	a / o	O
	Asphaltenes >30%	Asphaltenes >2% Paraffins <30%	Paraffins <30% Asphaltenes <2%	Asphaltenes >2% Paraffins >30%	Paraffins >30% Asphaltenes <2%
Curing Characteristic	Slow		Medium		Fast
	S		M		F
	Nitrogen bases <10%		Nitrogen bases 10-25%		Nitrogen bases >25%
Hydrocarbon Type	Paraffinic	Predominantly Paraffinic	Predominantly Naphthenic		Naphthenic
	P	p	n		N
	Δn_DSH: 0.000-0.010	Δn_DSH: 0.011-0.025	Δn_DSH: 0.026-0.040		Δn_DSH: 0.041-0.070

dues. Asphaltenes are responsible for the black color of products containing them.

Nitrogen Bases: (Component precipitable with 85% sulfuric acid). The nitrogen bases content of a plasticizer is responsible for its effect on cure. Nitrogen bases are, as a rule, present in petroleum products unless removed by treatment with acid. The color of nitrogen bases is dark brown, which also affects the color of mixtures containing them.

1st Acidaffins: (Component not precipitable with 85% sulfuric acid, but precipitable with concentrated (98%) sulfuric acid). This is the group which is mainly responsible for sulfur demand of a plasticizer, for building tack, and for compatibility of the plasticizer with rubber hydrocarbons. First acidaffins are one of the principal components of rubber extenders from petroleum (which extenders are also called unsaturated hydrocarbon extenders). The other main component of extenders is the 2nd acidaffins.

2nd Acidaffins: (Component not precipitable with concentrated (98%) sulfuric acid, but precipitable with fuming sulfuric acid of 20 to 30% SO_3 content). Unsaturation and sulfur demand of this component is lower than that of 1st acidaffins. Plasticizers consisting principally of 2nd acidaffins are also highly compatible with rubber hydrocarbons, including oil-resistant elastomers. Second acidaffins are the principal components of process oils of good compatibility with rubber hydrocarbons including oil-resistant rubbers. Process oils consisting principally of 2nd acidaffins, being free of the coloring asphaltenes, nitrogen bases and 1st acidaffins, are light in color and are, therefore, suitable for the manufacture of light-colored goods. The 2nd acidaffins should be the principal component of non-staining, non-discoloring, non-migrating process oils.

Paraffins: (Component not attacked by fuming sulfuric acid in the cold). This non-reactive group of components functions as a lubricant, counteracting tack and knitting properties. Paraffins are the main component of white oils, waxes, and lubricating oils. A small amount of liquid paraffin in plasticizers is beneficial for resilience and good tubing characteristics. High amounts, however, are detrimental to physical and processing properties, and cause blooming.

Hydrocarbon Type: (Determined on group listed as paraffins above). The value, Δn_DSH, which is the difference between the refractive index measured on the paraffinic (saturated) portion of the oil and the refractive index of the corresponding straight-chain paraffin, is a measure of the degree of paraffinicity or naphthenicity of an oil. Compatibility of saturated hydrocarbons with rubber hydrocarbons depends on the structure of the paraffins, cyclo-paraffins (naphthenes) being more compatible than straight-chain paraffins.

A great number of petroleum products have been analyzed, and the data obtained have been reviewed with the aim of establishing a sufficiently strict correlation between measured values and performance in rubber to allow the setting up of definitive specifications and a convenient code. Most of the data have been reported in preceding papers *(7, 8, 9)*. The results of the attempt to arrive at the desired nomenclature and specifications have been highly satisfactory in that it has been found possible to set up a uniform code and dependable specifications on the basis of a few simple measurements easily carried out in any laboratory.

Suggested Classifications

Table I is a chart which depicts the basis on which composition and performance can be correlated for the purpose of a code and specifications. The specifications are sufficiently broad not to constitute any unnecessary restrictions for suppliers, but are, on the other hand,

sufficiently narrow to assure that products coded by the same symbols are, for all practical purposes, identical in composition, thus guaranteeing to consumers reproducibility of results.

The chart explains how a product may be classified by viscosity, by product type, by influence on cure, and by hydrocarbon type. Capital letters are used to designate the main classifications and small letters to designate intermediate classifications.

Viscosity Specification: Viscosity is divided in five ranges. Since viscosity-temperature interdependence is governed by product type, which is also given in the code, it appears superfluous to specify more than one temperature. Room temperature (25°C.) was chosen because the differences in viscosities are more pronounced at this lower temperature.

Product Type Designation: Definition of type of product is based on the percentage composition as determined by the group analysis. The three main types are "resinous," "oily", and "asphaltic". "Resinous" refers to a product which has the steep temperature-viscosity curve characteristic of resins. "Oily" refers to a product with a rather flat temperature-viscosity curve characteristic of oils. "Resinous" products are predominantly unsaturated hydrocarbons; "oily" products, predominantly saturated hydrocarbons. The third main group is labeled "asphaltic", indicating that asphaltenes are the governing component of the product, being present in amounts of at least 30% of the total. The other two groups—"asphaltic-resinous" and "asphaltic-oily"—designate materials in which the principal "oily" or "resinous" components are mixed with non-distilled residues (asphalts).

These classifications relate also to the refining operations, which aids in understanding the nomenclature. The two main steps in refining oil are distillation and solvent extraction. Distillation separates the bulk of the volatile "resinous" and "oily" components from the non-volatile asphalts and impurities. Solvent extraction separates the "oily" from the "resinous" fractions, or, in chemical terms, divides the distillate into a fraction of low carbon to hydrogen ratio ("oily" or predominantly saturated fraction) and a fraction of higher carbon to hydrogen ratio ("resinous" or predominantly unsaturated fraction).

Curing Characteristics: The classification as to influence on cure shown in the chart is also based on the group analysis. It has been found in a great number of tests, some of them reported earlier *(7, 8)*, that petroleum products containing less than 10% nitrogen bases are almost without influence on cure, while 10% to 25% nitrogen bases have a slight activating effect, giving (when used in conjunction with the usually employed accelerators) a desirable plateau in the vulcanization curve. If the nitrogen bases content of a petroleum product is higher than 25%, the product can be considered fast-curing, and might, in some cases, cause scorchiness.

Hydrocarbon Type: This characteristic is based on the fact reported *(9)* that the value $\Delta n_D SH$ shown in the chart reveals how far-removed the saturated oil component is from straight-chain paraffinic structure.

The significance of this value can best be judged from

TABLE II—COMPARISON OF FIVE COMMERCIAL OILS BY ANALYTICAL DATA AND PROCESSING PROPERTIES

		Oil "A"	Oil "B"	G. B. Naphthenic Neutral No. 4	G. B. Medium Process Oil	Calidus G. P.
	Code (See Table I)	m —O petroleum Sp l	m —O petroleum Sn l	MO petroleum Mn	LR petroleum Sn	MR petroleum MN
Physical Characteristics	Specific Gravity	0.8967	0.9354	0.9665	0.9888	1.0165
	Viscosity SUS @ 100° F.	2458.0	2180.0	8215.0	516.0	7001.0
	Viscosity SUS @ 210° F.	151.1	85.3	149.0	48.0	90.3
	V. I.	97.2	—30.4	—65.6	—125.7	—428.0
Composition	*N*-Bases (%)	0.0	2.0	13.8	2.2	18.7
	1st Acidaffins (%) + 2nd Acidaffins (%)	44.0	45.7	49.6	82.3	70.5
	Paraffins (%)	56.0	52.3	36.6	15.5	10.8
Hydrocarbon Type Determination	n_D^{20}	1.4921	1.5178	1.5368	1.5556	1.5719
	Δn_D	0.036	0.062	0.081	0.110	0.123
	$n_D^{20}SH$	1.4777	1.4870	1.4883	1.4853	1.4917
	$\Delta n_D SH$	0.022	0.031	0.032	0.039	0.043
Processing Properties	Tack	None	Poor	Fair	Good	Excellent
	Knitting Behavior	Poor	Poor	Good	Excellent	Excellent

TABLE III—ABBREVIATED CODE CHART FOR PETROLEUM PRODUCTS FOR RUBBER

Viscosity in cP @ 25° C.	Low	Medium	High
	L	M	H
	<5,000	5,000-50,000	>50,000
Product Type	Asphaltic	Resinous	Oily
	A	R	O
	Asphaltenes >2%	Paraffins <30%	Paraffins >30%
Curing Characteristic	Slow	Medium	Fast
	S	M	F
	N-Bases <10%	N-Bases 10%-25%	N-Bases >25%
Hydrocarbon Type	Paraffinic		Naphthenic
	P		N
	$\Delta n_D SH$ <0.025		$\Delta n_D SH$ >0.025

the data in Table II. This table shows, for five commercial products, some of the most quoted physical characteristics, analytical data determined by the group analysis, values based on refractive index, and observed tack and knitting properties of co-coagulates of the products with high Mooney GR-S.

In evaluating the products listed, the data for composition and $\Delta n_D SH$ have to be considered together. It can be seen, for instance, that products "A" and "B" are quite close in composition when the data obtained from the group analysis only are taken into account. However, the value of $\Delta n_D SH$ reveals that "A" is paraffinic while "B" is naphthenic, which appears to be the determining factor in comparing these two oils. In terms of compatibility with rubbers, this means that if an oil has a high amount of saturated hydrocarbons, it is more compatible with rubber hydrocarbon if the saturated hydrocarbons are naphthenic. However, it has to be kept in mind that a tendency to bloom still exists when an oil contains a high amount of saturated hydrocarbons. Product "B" will, for instance, bloom considerably out of neoprene if used in amounts of more than 15 or 20 parts. With GR-S, blooming is often not immediately evident, but the lack of compatibility is the reason why blends of co-coagulates of high Mooney GR-S and oils "A" and "B" show poor knitting properties and crumble when dumped from the Banbury. The high content of saturated hydrocarbons of some oil-extended rubbers is also responsible for the difficulties experienced in splicing.

The difference in compatibility of the five oils is qualitatively revealed by the Δn_D values of the unfractionated products, which range from 0.036 to 0.123. The value 0.036 for Oil "A" and the value 0.062 for Oil "B" explain why blooming is readily observable with Oil "A," but not as obvious with Oil "B". It is indicative of the existing confusion regarding petroleum products that the five products shown in Table II are often considered and designated alike by compounders as processing oils although they are of entirely different composition.

Suggested Codes and Symbols

Since the chart shown in Table I characterizes petroleum products on the basis of four groups of properties, a four-symbol code can be set up to name and define any of the products distinctly. The only exception is asphaltic products, for which melting point and penetration are also important and should be specified.

A three-symbol code can be used if for the generic term "petroleum" more specific terms are substituted, such as extender, processing aid, lubricant, or asphalt, defining an extender as a product containing less than 15% paraffins, a processing aid as a product having 15% to 30% paraffins, a lubricant as a product having more than 30% paraffins, and an asphalt (or residue) as any petroleum product containing more than 2% asphaltenes. Using these specific definitions, any petroleum product can then be defined by three symbols.

As a further simplification, viscosity could be divided into three groups, and hydrocarbon type into two groups. The three viscosity groups would be:

L (low) ..... less than 5,000 cP
M (medium) ..... 5,000 to 50,000 cP
H (high) ..... more than 50,000 cP

A simplification in designating hydrocarbon type can be achieved by using 0.025 as the border value for $\Delta n_D SH$, in which case a $\Delta n_D SH$ lower than 0.025 would denote paraffinic, and a $\Delta n_D SH$ higher than 0.025 would denote naphthenic. A very simple chart, shown in Table III, could then be used for coding of all petroleum products used as plasticizers for rubber with the above-mentioned exception regarding solid asphaltic products (specifications for melting point and penetration required).

Both codes are considered useful; the abbreviated three-symbol code is not suggested as an alternative, but as an alternate code. The four-symbol code (Table I) is recommended for designating petroleum products in cases where fine distinctions appear desirable, as in research work; the three-symbol code (Table III) is, however, believed more practical for general usage.

TABLE IV—ANALYTICAL DATA AND CODES FOR SOME COMMERCIAL PETROLEUM PRODUCTS

Proprietary Name	Supplier	Analytical Data							4 Symbol Code	3 Symbol Code
		Viscosity in cP @ 25° C.	% Asphaltenes	% N-Bases	% 1st Acidaffins	% 2nd Acidaffins	% Paraffins	$\Delta n_D SH$		
G.B. Asphaltenes	Golden Bear Oil Co.	Solid	47.9	30.3	4.6	13.2	4.0	0.038	HA petroleum Fn	Asphalt HFN
Califlux 550	Golden Bear Oil Co.	200,000	0.0	27.1	18.9	47.1	6.9	0.038	HR petroleum Fn	Extender HFN
Califlux TT	Golden Bear Oil Co.	42,000	0.0	23.1	21.0	47.2	8.7	0.041	$\frac{m}{h}$R petroleum MN	Extender MMN
Califlux G.P.	Golden Bear Oil Co.	12,000	0.0	16.9	18.0	54.0	11.1	0.044	MR petroleum MN	Extender MMN
Califlux 510	Golden Bear Oil Co.	450	0.0	11.4	18.9	58.2	11.5	0.038	LR petroleum Mn	Extender LMN
G.B. Medium Process Oil	Golden Bear Oil Co.	320	0.0	2.2	20.2	62.1	15.5	0.039	LR petroleum Sn	Aid LSN
G.B. Light Process Oil	Golden Bear Oil Co.	55	0.0	0.0	16.5	59.2	24.3	0.037	LR petroleum Sn	Aid LSN
G.B. Naphthenic Neutral No. 2	Golden Bear Oil Co.	70	0.0	4.1	11.1	34.3	50.5	0.032	LO petroleum Sn	Lubricant LSN
G.B. Naphthenic Neutral No. 4	Golden Bear Oil Co.	7,000	0.0	14.6	14.3	35.4	35.7	0.032	MO petroleum Mn	Lubricant MMN
Paraflux (Western Sample)	C. P. Hall Co.	17,000	12.9	13.8	12.5	23.4	37.4	0.032	M $\frac{a}{o}$ petroleum Mn	Asphalt MMN
Dutrex 20	Shell Oil Co.	39,000	0.0	23.9	23.0	47.9	5.2	0.038	$\frac{m}{h}$ R petroleum Mn	Extender MMN
Dutrex 15E	Shell Oil Co.	13,000	0.0	31.8	15.5	31.2	21.5	0.023	MR petroleum Fp	Aid MFP
Circosol 2XH	Sun Oil Co.	1,750	0.0	2.0	6.0	39.7	52.3	0.031	$\frac{m}{l}$ O petroleum Sn	Lubricant LSN
Sundex 53	Sun Oil Co.	283	0.0	3.2	8.4	64.3	24.1	0.026	LR petroleum Sn	Aid LSN
Circo Light Process Oil	Sun Oil Co.	62	0.0	2.0	6.5	33.6	57.9	0.034	LO petroleum Sn	Lubricant LSN

Table IV shows, by giving some well-known products as examples, how these codes can be applied. The four-symbol code has been set up with two symbols before and two after the word "petroleum", which makes the designations easier to read than listing the four symbols in a row. Using Califlux G. P. as an example, the two designations would be:

In the four-symbol code: *M*edium Viscous, *R*esinous *petroleum M*edium Curing, *N*aphthenic.

In the three symbol code: *Extender M*edium Viscous, *M*edium Curing, *N*aphthenic.

The codes and specifications as suggested would serve the aim of establishing symbols sufficiently definitive and descriptive to assure the desirable simplification and uniformity.

Experimental Details

All of the values used as a basis for the codes are easily measured with very simple and inexpensive equipment. Viscosity can, for instance, be measured quickly by the use of a set of Gardner Tubes *(10)*; product type and curing characteristics are determined on a one-gram sample by the group analysis described in detail in a previous paper *(7)*; hydrocarbon type is established *(8)* by measuring the refractive index of the saturated hydrocarbon component (last fraction obtained in the group analysis), and making a simple calculation, for which the other two necessary values (number of carbon atoms and refractive index of corresponding straight-chain paraffinic hydrocarbon) can be read from published graphs *(9, 11, 12)*.

Summary

Two codes of symbols and specifications for petroleum products used as plasticizers for rubber, based on chemical characteristics easily measured in any laboratory, are suggested—a four-symbol code for exact research work and a three-symbol code for broad general classification and commercial usage. These codes and specifications, based on quantitative data, are designed to eliminate the existing confusion regarding petroleum products of high boiling range used as compounding ingredients for rubber.

Standardization of quality on the basis of specifications which assure uniformity of materials and reproducibility of results is of primary importance to the progress of our modern industry, which is based on cooperation and fair competition. The trend to share knowledge is characteristic of the prevailing influence of scientifically-trained men in industry and business today. The policy of secret formulations, the pride of patent medicine manufacturers, which was predominant in the early development of the rubber industry, has almost disappeared.

One of the last strongholds of secret composition is in certain petroleum products used as compounding ingredients for rubber. It is hoped that the codes and specifications suggested in this paper will be acceptable to the rubber industry and to the supplying petroleum industry, and by this means correct one of the last unscientific approaches to compounding.

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Simple Procedure for Repairing Conveyor Belts

IN order to get the maximum service life out of conveyor belting, industrial users should take particular care to repair all belt damage as soon as it is discovered. Belt fabric exposed to weather will absorb moisture if the protective cover becomes damaged, and may even become soaked. In warm weather, this condition leads to mildew and rot; in winter, ice crystals may gnaw at the fabric from within as the belt flexes. Thus, immediate repairs not only prevent the spread of damage, with its threat of premature failure, but also keep out the water which is the natural enemy of any conveyor belt.

Simple tools and procedures, recommended by the Thermoid Company, Trenton, N. J., will help the maintenance man to give belting proper attention. An adequate repair kit includes sharp cobbler's knives and a stone to keep them sharp, a supply of emery cloth, rubber cement, inner tube patching rubber, rip plates and standard belt fasteners and accessories, together with rags and gasoline for cleaning. As each belt is installed, remnants should be kept, because they will prove useful in subsequent repairs.

To mend long and deep cuts which go through to the fabric, open the cut, clean out all dirt, and cement the cut closed, allowing the cement to dry throughly before the belt is restored to service. Where bits of torn cover leave exposed spots with only slight damage to the fabric, remove the loose ears of cover stock by carefully cutting a curved and bevel-edged area around the spot; then sand the edges, apply cement, allow it to dry, apply tire patching rubber and finally skive the patch flush with the belt cover.

Where gouges have penetrated the belt, or longitudinal rips have occurred, these points must be cleaned, sanded, cemented and reinforced with rip plates at three-inch intervals. Transverse rips require similar treatment with standard belt fasteners instead of rip plates. Use rip plates on longitudinal rips only, and standard fasteners on transverse rips only. When holes in the belting do not permit the simple use of rip plates and fasteners, cut out the hole into the smallest possible rectangle with its sides parallel to and at right angles to the belt edges. Then, from belting remnants, cut an exact fit for the hole and insert the piece, fastening it with belt fasteners all around the patch. Cement all edges thoroughly. Where it is necessary to prevent seepage of fines through belt repairs, remove one ply of fabric from a belt remnant and place it under the various fasteners and rip plates.

Editorials . . . . . .

Open Competition

EVER since the imposition of controls on the consumption of natural rubber in the United States, plus the mandatory consumption of government-made synthetic rubber, the producers of natural rubber have decried what they considered to be a completely inequitable situation. Open competition between the natural and synthetic types of rubber was stymied, and the producers clamored for an opportunity to fight the battle of natural versus synthetic without governmental interference. The recent action of the National Production Authority in eliminating practically all remaining controls over the domestic rubber manufacturing industry brings this opportunity into actuality.

In a sense, however, the battle is not fully joined, since NPA has been directed by the Defense Production Administration to maintain for security reasons minimum annual consumption levels of 450,000 long tons for GR-S and 60,000 long tons for Butyl rubber, or roughly 40% of present annual over-all consumption of new rubber. Should annual consumption fall beneath these levels, NPA has the authority to reinstitute specification controls over end-products which would guarantee maintaining them. Further, for the next six weeks or so the government will continue to sell natural rubber through the General Services Administration at a fairly high price (48½ cents a pound at this writing, although it is expected to be reduced sharply for June deliveries).

The virtual ending of approximately 10 years of domestic rubber control opens for the first time, however, relatively free competition between natural and synthetic rubber. While the technical advantages of the respective materials will have some weight in the eventual selection of one or the other for specific end products, economics will be the major decisive factor. At the moment, GR-S is selling at a price-fixed 23 cents a pound (with some talk of another 2 or 3-cent reduction in the near future) as against approximately 38 cents a pound for No. 1 Ribbed Smoked Sheet at Singapore. Since most purchases for the American market are for lower grades of natural rubber, the spread is not quite the 15 cents a pound the above prices indicate.

Because of the current spread in price between the two materials, many domestic rubber manufacturers have indicated they have no intention of switching back to natural rubber after July 1, despite the removal of restrictions. Natural rubber producers are well aware of this situation and realize that the price of natural rubber must be brought down considerably before they can regain the major portion of the American market. Whether it would have to be brought down to the current level of the GR-S price is doubtful, since many rubber manufacturers would probably pay a 3 to 4-cent premium for the natural over the synthetic rubber product.

Producers of natural rubber face several major problems in any effort to lower their costs so that they can reasonably compete with the synthetics. Labor, which constitutes between 60 and 70% of their costs, is considerably higher than in recent years, with tappers now getting about $1.35 a day as against approximately 90 cents a day two or three years ago. The cost of protecting managers and workers in Malaya and Indo-China against marauding Communist bands is appreciable, to say nothing of losses resulting from the gouging and slashing of trees by these same roving bands. Plantation operators hope to make up some of these higher costs by increased yields from bud-grafted areas, but the day of 2,000-pounds-per-acre is still several long years off.

It is still our feeling that in the long run any talk of a battle for market position between natural and synthetic rubbers is strictly academic, since there is plenty of room in the world position for both materials. There will be peaks and valleys in the years to come—rubber's history has long been feast or famine—but based on an inevitable rising consumption, world demand will gobble up all available new rubber. One has only to realize how many thousands of tons of rubber are called for by the slightest rise in per capita consumption or by some relatively new application, such as rubber in roads.

The competitive element will be considerably sharpened when private industry eventually takes over the manufacture of general purpose synthetic rubber in the United States. Such competition is bound to result in better rubber products for the consumer. Technical improvements will be incorporated in the synthetic rubbers by the manufacturers while the producers of natural rubber will strive for cleaner, more uniform and better packed bales. Steps in these directions have already been made, and will be heightened in the future. The next ten years should be an interesting decade in rubber.

NEWS OF THE MONTH

TERMINATION OF PRINCIPAL RUBBER CONTROLS ANNOUNCED BY NATIONAL PRODUCTION AUTHORITY

THE National Production Authority has revoked specification controls limiting the amount of natural rubber which may be used in making end rubber products. The action was taken in a revised edition of NPA Order M-2, dated April 21, and became effective as of the same date. In announcing the order, which virtually brought to an end ten years of rubber control, NPA Administrator Henry H. Fowler stated that the natural rubber supply in the United States has finally permitted the removal of all restrictions on the consumption of natural rubber with the exception of pale and sole crepe, both of which still remain in short supply. Mr. Fowler also made it known that NPA has been directed by the Defense Production Administration to maintain minimum annual consumption levels for both GR-S and Butyl rubber for security reasons, these being 450,000 long tons for GR-S and 60,000 long tons for Butyl.

The Reconstruction Finance Corporation has also been directed by DPA to produce GR-S at an annual rate of no less than 600,000 long tons until, in addition to satisfying all other requirements, a government-owned inventory of at least 75,000 long tons is accumulated. When this point is reached, production of GR-S may be allowed to fall to no less than 450,000 long tons annually, but only with a corresponding increase of GR-S inventory in government hands up to at least 122,000 long tons.

Mr. Fowler said RFC has advised that these inventories would be sufficient, when used to supplement GR-S production, to enable RFC to supply the industry at the full GR-S capacity rate of 860,000 long tons yearly during the period needed to get the plants back into actual production at that rate.

GR-S Consumption Rate

Mr. Fowler noted, however, that GR-S consumption is currently running at a rate of over 700,000 long tons annually and Butyl at more than 80,000 tons, and concluded that there is little chance that industry usage of synthetic rubber will drop to the 450,000 and 60,000 ton levels.

The decontrol action fulfills the objective recommended by the Rubber Industry Advisory Committee on March 26, when the committee proposed that the natural rubber restrictions be removed but that government rubber producing facilities be maintained at a level sufficient to provide for national security.

It is expected that consumption of GR-S and Butyl will be maintained by the industry without mandatory controls. However, NPA has standby specifications for the mandatory consumption of GR-S and Butyl which will be put into effect immediately, should consumption fall below levels set by DPA.

The April 21 amendment also terminated the allocation of Butyl, the 60-day inventory limit on natural rubber and the 30-day limit on Butyl, thereby further opening the way to free competition between natural and synthetic rubber. GR-S allocation and inventory provisions were dropped some time ago. All types of rubber, however, remain subject to the practicable minimum working inventory restriction of NPA Regulation No. 1. The amended order continues the following in effect:

(1) The prohibition of the private importation of natural rubber (except by permission of the General Services Administrator). This prohibition expires June 30, 1952, however, with respect to dry natural rubber, and will be revoked insofar as it concerns natural rubber latex as soon as government stocks are liquidated.

(2) The requirement that the percentage of all dry GR-S which may be purchased from RFC in the form of cold rubber cannot exceed 50%.

(3) The prohibition of the use of pale and sole crepe rubber in the manufacture of pneumatic tires, shoes, shoe soles, welting and wrappers.

(4) The limitation on the use of high tenacity rayon in rubber products to 120% of the amount used during the three-month period ending June 30, 1951.

(5) The reporting requirements with respect to rubber consumption and stocks; tire, tube and camelback manufacture, and latex imports.

Industry Greets Decontrol

NPA's revocation of rubber controls was greeted with enthusiasm by the rubber industry which finds itself free of government restrictions on the use of its basic raw material for the first time in over 10 years.

"By this action, the synthetic rubber industry comes of age and the day will live long in the memory of the world's rubber industry," asserted W. J. Sears, vice-president of the Rubber Manufacturers Association. "American-made synthetic rubbers have established themselves in the world market place. They will never again need the protection of government regulation. With this decontrol action," Mr. Sears said, "the industry can look forward with confidence and assurance to the final step —ultimate transfer of the synthetic plants from government to private hands."

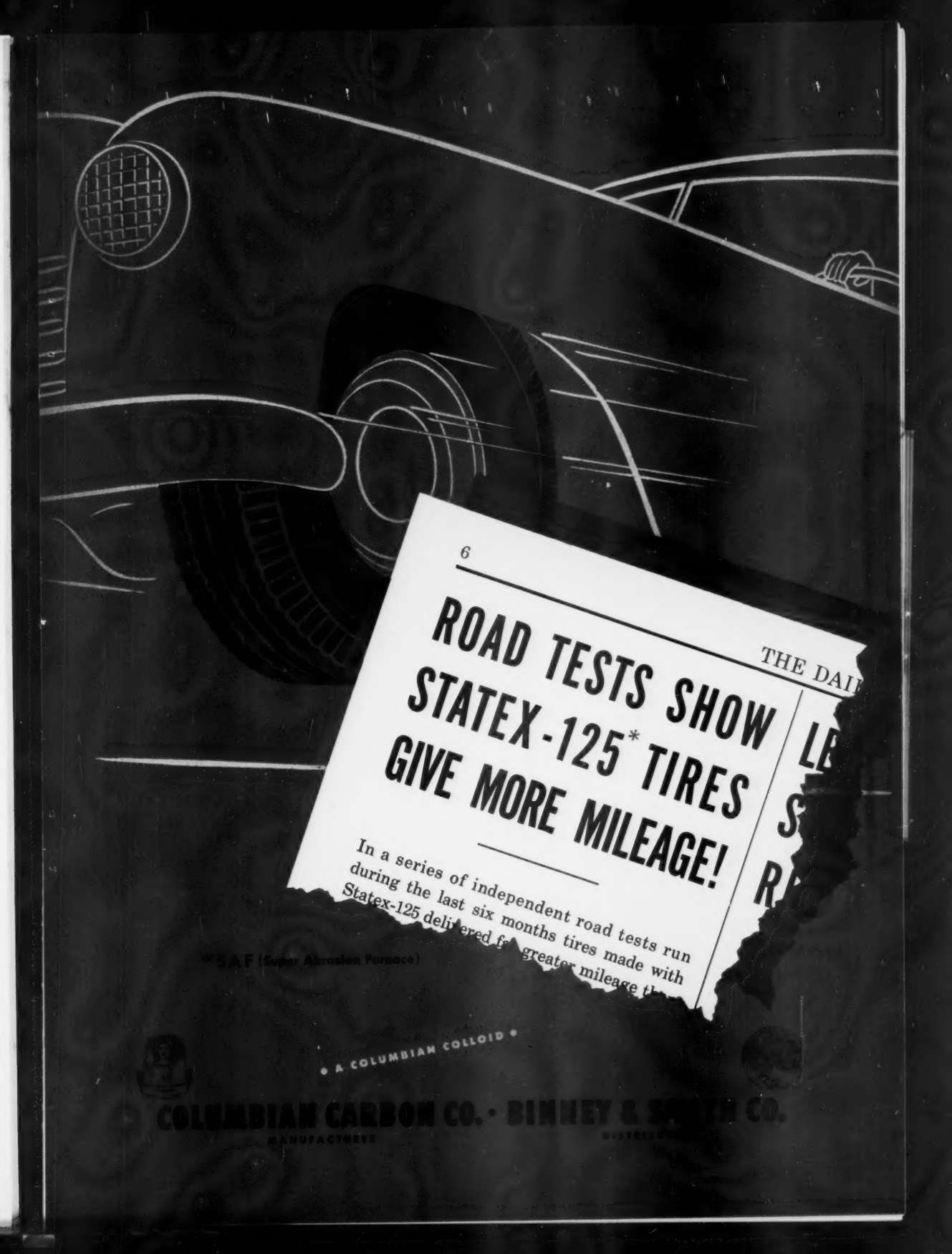
NPA's action freed U. S. manufacturers of rubber consumption controls for the first time since June 21, 1941—six months before Pearl Harbor. Mr. Sears praised both the Rubber Division of NPA and the other agencies of the government concerned with the rubber problem for moving promptly to decontrol as soon as supplies of this critical raw material were brought into balance with over-all defense needs and civilian demand.

Historically, it was noted that rubber controls have moved through several stages and were tailored to meet varying conditions. Controls were first established in 1941 to conserve natural rubber for military and essential civilian uses during World War II. In the immediate post-war period they were re-shaped to gradually increase natural rubber consumption as producing areas were rehabilitated after Japanese occupation. From 1948 until just before the outbreak of the Korean War, controls were designed chiefly to support a minimum consumption of synthetic rubber as a security measure. After June of 1950, they were re-tailored to funnel the maximum amount of natural rubber into government hands for a rapid build-up of strategic stocks.

Restriction on Competition

During this latter period, Mr. Sears pointed out, natural rubber producers were frequently emphatic in their complaint that U. S. controls unduly restricted the "area of competition" between natural and synthetic rubbers. "NPA's decontrol action removes any basis for complaint of unfair restrictions on international trade in rubber. From now on, natural and synthetic rubbers will compete in an unregulated market. The decision lies with industry rather than government, and such factors as quality, cleanliness, uniformity and cost will figure freely in the choice of raw materials," he said.

Mr. Sears, who was the administrator of rubber controls for the War Produc-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tion Board and the Civilian Production Administration, stated that "cooperation between the defense agencies and the rubber manufacturing industry has been continuous and effective in the highest degree since 1941. In the current emergency, this cooperation permitted a rapid accumulation of security stocks and on schedule production of military products with the least possible impact on production of rubber goods for civilian use."

"As a result of this cooperative effort, we now move into an era of decontrol with our manufacturing capacity vastly expanded to meet all foreseeable military and civilian needs, with our stockpile in good shape, and with supplies of natural and synthetic rubber more than adequate to meet our needs.

"Moreover, we have attained a measure of security in rubber beyond our wildest dreams in 1941. In addition to the very substantial stockpile of natural rubber, we have had more than 10 years of experience with upwards of 700 different types of synthetic rubber. Many of the synthetic rubbers are superior to any rubber or rubberlike material we have known before. We have in being a vigorous synthetic rubber industry, capable of producing approximately a million tons of rubber a year. We have behind us invaluable experience in the emergency reactivation of standby synthetic rubber plants. In 'cold' rubber and the new oil-extended rubbers we have raw materials of great promise and moderate cost. In our opinion, this progress spells 'Security in Rubber' with a capital 'S'," Mr. Sears said.

Outlook for Synthetic

For the long pull, synthetic rubber will continue to be used in vast quantities, Mr. Sears predicted, noting that world rubber consumption has doubled each decade since the turn of the century. He estimated that 1960 use would rise 44 per cent over 1950. Present production of both natural and synthetic rubber will have to be increased to support that level of consumption, he asserted.

"From now on, natural rubber will find American-made synthetic rubber a stiff competitor," Mr. Sears declared. "Synthetic rubber accounts for 65 per cent of our current rubber consumption in the United States, and all rubber products are of satisfactory quality. Quality of both the raw material and end products is vastly improved. The cleanliness, uniformity and packaging are vastly superior to natural rubber and are factors which make it particularly attractive to the manufacturer.

"The future success of natural rubber as a competitor rests on the ability of producers to develop a clean, uniform product, properly graded and packaged. Improvements in that direction are long overdue," Mr. Sears asserted.

NPA's action leaves the Rubber Act of 1948 as the principal remaining control over the rubber manufacturing industry. Under the act, the synthetic plants are retained in government hands until its renewal or its expiration on June 30 of this year. The act carries a provision which permits the government to impose mandatory synthetic rubber use controls on the industry, should consumption of the GR-S and Butyl drop below levels determined by the President to be necessary for national security. Security minima set in the act are GR-S 200,000 long tons per year; Butyl 22,000 long tons per year. The current use minima established by the government are well over the figures established in the legislation but substantially below what will be consumed on a voluntary basis. Consumption in 1951 was: GR-S 627,567 long tons; and Butyl 70,570 long tons.

In commenting on the decontrol action, Mr. Sears singled out several members of the government's rubber team for credit in administering the controls program "capably, efficiently and courageously." He named NPA Rubber Director E. D. Kelly and his deputy H. D. Brown; L. E. Spencer, Director of the Synthetic Rubber Division of the RFC; George Casto, Director of the Rubber Division of GSA's Emergency Procurement Service; Fred Bates, Chief of the Chemicals and Rubber Division of the Munitions Board, and Willis C. Armstrong, Special Assistant for the State Department's Office of International Materials Policy.

Synthetic Ceiling Prices Cut

On May 6, 1952, dollars-and-cents ceiling prices on GR-S sold by RFC were cut back an average of three cents a pound by the Office of Price Stabilization. This ceiling reduction is in keeping with RFC's recently announced price cut made possible primarily by a decrease in the required use of high-cost alcohol butadiene. The reduction was made in Amendment 2 to SR 57 to GCPR.

In November, 1950, RFC had applied for and had been granted by the Economic Stabilization Agency a price increase of 6c per pound for GR-S, from 18½ to 24½c, in order to cover the cost of reactivating idle plants as well as the higher estimated cost of production from alcohol.

Under the provisions of SR 57, effective September 1, 1951, RFC was authorized further to increase its price for GR-S from 24½ to 26c per pound, so as to cover the cost of bringing in additional production. That increase in price was required to maintain the synthetic rubber production of RFC on a break-even basis. To obtain an annual volume increase from 760,000 tons to 860,000 tons, RFC had to make greater use of ethyl alcohol, a more expensive source for synthetic rubber than butadiene derived from petroleum.

In reviewing its production costs, RFC recently determined it was able to reduce its selling prices of GR-S by an average of 3c per pound and still maintain a break-even position. Accordingly, it announced these reductions as effective March 8, 1952.

To relieve distributors of GR-S latex from a replacement squeeze, Amendment 1 to SR 57 was issued by OPS effective October 17, 1951, authorizing distributors to increase their ceiling prices for resale of latex, which they purchase from RFC, by the amount of the increase granted to RFC in SR 57.

The May 6 amendment also reduces the ceiling prices applicable to distributors by the amount of reduction in RFC ceilings. Under Amendment 2, a latex distributor is permitted to retain the amount of his dollars-and-cents margin over the government's prices which he had in effect during the base period provided in the GCPR —December 19, 1950, to January 25, 1951, inclusive.

If a distributor did not sell a particular type of latex during the base period, his ceiling price for such latex is that of his closest competitor as provided under Section 6 of the GCPR. If in such case Section 6 cannot be applied, the distributor should file an application for a ceiling price under Section 7 of the GCPR.

It is considered that distributors will have had ample opportunity before the effective date of this amendment to dispose of GR-S latex purchased at the higher RFC prices in effect before March 8, 1952.

Synthetic Output Hits Peak

The U. S. Tariff Commission reported on April 30 that synthetic rubber production hit an all-time high in 1951 of 2,003,000,000 pounds, nearly 72% greater than the 1,166,000,000 turned out in 1950. The previous record was the 1,904,000,000 pounds produced in 1945, when the industry hit its full wartime stride. Last year's record came about chiefly through the reactivation of war-born government plants to meet high demand. Sales of synthetic in 1951 totaled 1,827,000,000 pounds, valued at $515,000,000, an increase of 47.5% in quantity and of 70.8% in value over 1950.

Production of polybutadiene-styrene synthetics accounted for 1,561,000,000

Heated Dugout for Dodgers

The Brooklyn Dodger baseball players will now be comfortably warm while they are in the dugout at Ebbets Field waiting to play. Uskon electrical radiant heating panels, made by U. S. Rubber, have been installed vertically as back rests so that players on the bench may have a warm surface to lean against during cooler days and nights. Each of the conductive rubber panels are ¼-inch thick, 3 by 4 feet, and rated at 28 watts per square foot. They will provide a maximum surface temperature of about 115°F. when the outdoor temperature is 60°. The panels are fastened to 2 by 3-inch furring strips with No. 8 brass flat head screws. This leaves clearance for the electrical connection boxes, and allows a free flow of air behind the panels. Snap switches are located so as to avoid accidental switching. After a coating of shellac, the panels received a coat of green paint in keeping with the color pattern in the park.

pounds, up 94.5% in the year. Sales of GR-S totaled 1,406,000,000 pounds, valued at $353,000,000, compared with 880,000,000 pounds which sold for $171,000,000 in 1950. All but 4,995,000 pounds of these types of synthetic rubber were made and sold by the government.

Production of acyclic elastomers, consisting of special purpose types such as polybutadiene-acryonitrile, isoprene, and polyvinyl types, amounted to 442,000,000 pounds or 78,000,000 pounds more than the 364,000,000 pounds reported in 1950.

Sales in 1951 were 421,000,000 pounds, valued at $163,000,000, compared with 359,000,000 pounds, valued at $131,000,000, in 1950. In 1951, as in previous years, the acyclic elastomer produced in the largest volume was GR-I. Production of GR-I in 1951 amounted to 166,000,000 pounds, or 37.5% of the output of all acyclic elastomers.

Natural Price Cut Expected

Informed sources are predicting that the long-anticipated slash in the government's selling price of natural rubber will come in time for June delivery. These sources are of the opinion that the new price for high grade ribbed smoked sheets and for ambers will be approximately 10c a pound under present grades, a factor which could influence a move toward lower prices for tires generally.

For the past few months the government has been paying considerably less for the rubber in world markets than the 48½c a pound it is getting from industry for the better grades. Under the law, the General Services Administration, the buyer and seller, is not permitted to make any profit. As a result, the forthcoming price to industry will reflect the lower cost to the government.

Other News of Interest

Off-Specification Rubbers: RFC has announced that effective with shipments as of April 7, off-specification GR-S and GR-I will be sold at a discount of 10% from the price of the specification rubbers. GR-S plant clean-up material will be sold at a discount of 20% from the price of standard GR-S. The selling price of Butyl plant clean-up material will be 15c a pound.

Butadiene: An expansion goal for butadiene was announced on April 11 by DPA calling for an increase to 162,000,000 pounds by January 1, 1954, an increase of 101,000,000 pounds over January 1, 1951. The butadiene goal applies to only that 10% of production by privately-owned plants. The capacity for government-owned plants is expressly excluded.

Carbon Black: DPA has set a new expansion goal for carbon black calling for the production of 2,320,000,000 pounds annually by January 1, 1955, 800,000,000 pounds more than produced on January 1, 1951. Historically, the U. S. has supplied all of the world's carbon black requirements, exporting up to 35% of its production. World requirements for all types of carbon black by 1955 are estimated at 2,464,000,000 pounds. U. S. capacity as of January 1, 1951, plus prospective foreign capacity, totals 1,663,000,000 pounds, leaving a deficit of 800,000,000 pounds to be supplied by U. S. expansion.

Steel: The Rubber Division of the National Production Authority has been allotted 175 tons of carbon structural steel in the first quarter of this year, 172 tons in the second quarter and 150 tons in the third quarter. Amounts determined in the first and third quarters were not limited in the program determination as to the amount of structural steel due to the small usage of structural steel by the division.

Polyvinyl Alcohol: Colton Chemical Co., Cleveland, Ohio, has announced that its new polyvinyl alcohol plant in that city will be in production on June 1. The new unit will increase the company's capacity for producing polyvinyl alcohol to 100,000 pounds per month.

Senate: The Senate Armed Services Committee has named a three-man subcommittee to hold hearings on the extension of the Rubber Act of 1948, scheduled to expire on June 30, 1952. The House has already approved a two-year extension of the law.

Labor: Labor shortages continue to be the most pressing industry problem, the Rubber Processing Machinery Industry Advisory Committee told NPA recently. The sole remedy, proposed by a Labor Department representative, is for industry members to seek Wage Stabilization Board adjustments on current pay scales in order to compete in the labor market.

England: The "Investor's Chronicle", a weekly financial journal published in London, has sharply criticized the American attitude toward Malayan rubber. The publication stated that the U. S.-owned synthetic rubber industry represents a menace to the free peoples of the Far East in that it has enabled the American government to bring down the price of natural rubber to a level which is uneconomic.

GR-S Consignments: RFC recently advised rubber consumers that consideration was being given to the possibility of shipping quantities of GR-S on a consignment basis for storage in consumer's plants. On April 30, the agency reported that a survey indicated that the plan was not practicable and accordingly has been dropped.

Sebacic Acid: Allocation controls on sebacic acid were revoked by the NPA Chemical Division on April 30. The material now is in good supply and protection of military requirements is assured since sebacic acid is subject to military DO ratings under NPA Regulation No. 2.

Davidson Heads New AEC Office

On May 1, the Atomic Energy Commission established at its Washington, D. C. headquarters a new Office of Industrial Development headed by Dr. William Lee Davidson, formerly director of physical research for the B. F. Goodrich Co. The purpose of the new office will be to aid in the administration of the industrial participation program—involving studies of power generation—and to expand the areas in which all types of industry may find an interest in the national atomic energy program. Dr. Davidson, a graduate of the College of William and Mary, was director of physical research for Goodrich from 1947 until taking the AEC assignment. Before joining Goodrich, he was associated with the Monsanto Chemical Co. He obtained his doctor's degree in physics from Yale University in 1940. He is co-author of "Applied Nuclear Physics."

Indicted for Tax Evasion

Poncet Davis, president of the Robbins Tire & Rubber Co., has been indicted by a Federal Grand Jury sitting in Cleveland, Ohio, on charges of a four-year tax evasion of $738,249. The grand jury accused Mr. Davis of paying only $80,067 when he actually owed $818,316. It put his taxable income at $1,030,828 for the four-year period, 1945, 1946, 1947 and 1948. During these years, Mr. Davis was drawing approximately $60,000 a year, however, it was charged that he diverted other income from the corporation to his own personal use without reporting it as income or paying the tax due. Mr. Davis pleaded innocent to the four-count indictment and was released on $10,000 bond.

HARWICK STANDARD CHEMICAL CO. OPENS NEW PLANT IN AKRON

More than a thousand representatives of rubber, plastics, chemical and other firms attended the Harwick Standard Chemical Co. "Open House" celebration at Akron, Ohio, on April 5, marking the opening of the company's new plant. The new building, rebuilt after the disastrous fire on the night of May 1, 1951, provides many additional features including a complete product control laboratory, a tank farm with 60,000-gallon storage capacity and more warehouse space. The new Harwick plant was rebuilt at a cost of approximately $300,000 and now gives the company two full floors for their own warehousing and administrative activities.

SPI DRAFTS PROPOSALS FOR NEW VINYL FILM STANDARDS

Drafts of proposals for a vinyl plastic film standard and industry trade practice rules were presented on April 22 at a meeting of the Society of the Plastics Industry at the Hotel Astor in New York City. The vinyl film standard was presented by Roger C. Boyd of the Union Carbide and Carbon Corp. The standard is the work of eleven technical committees of SPI. These committees have been considering the problem since March, 1946. The vinyl film standard will shortly be presented to the U. S. Department of Commerce for promulgation into a voluntary industry standard.

The trade practice rules were submitted by Alvin B. Roberts of Ross & Roberts, Inc. These rules, first presented at the December, 1951 meeting of the Vinyl Film Division, SPI, are being sent to all industry members for comment and recommendation. The proposed SPI commercial standard for general purpose vinyl plastic film, follow:

Property	*Method*	*Limit*
Thickness	SPI	±10%
Yield	"Calculated"	Complete Rolls ± 5%
Width	Steel Type	Short Length ±10% On Core ±½",—0"
Elevated Temp. Shrinkage	SPI	7% max.
Crocking	AATCC	No Perceptible Transfer
Heat Sealing	.....	Readily Sealable
Tensile Strength	ASTM D882-49T, Method B	2100 psi, min.
Ultimate Elongation	ASTM D882-49T, Method B	150%, min.
Tear Resistance	ASTM D689-44	180 grams or 60 grams/mil
Plasticizer Volatility	SPI	3 mil—10 %, max. 4 mil— 9 %, max. 6 mil— 7.5%, max. 8 mil— 5 %, max.
Water Extraction	SPI	1% max.
Low Temperature Impact	SPI	80% OK at 0°F.
Flammability	SPI	5 sec., min.

The Trade Practice Rules Committee of SPI has drafted a sales note agreement regulating the following procedures: passing of title; storage and insurance; terms of collection and credit; cancellations; rejections and claims; defaults in payment; casualty; compliance with standard; and a section on other contingencies. A provision in the sales note agreement to the effect that any controversy arising under, or in relation to, a given contract, be settled by arbitration was also suggested.

These trade rules, based on the Worth Street Rules for the Cotton Industry, Mr. Roberts advised, ought to be approved by the Federal Trade Commission and established as the code for business procedure for the industry. By using the authority of the FTC, it was explained, the rules have official status, minimizing the possibility of the industry being exposed to legal action.

It was finally suggested that an informal Industry Steering Committee, which has been guiding SPI film activities, be superseded by a regularly appointed administrative committee to coordinate the activities of the technical groups.

VINYL SPECIALTIES

Washington Glove Corp., Milwaukee, Wisc., is manufacturing reversible work gloves which fit either hand and have a long-wearing protective coating of Vinylite resins. A free swinging thumb permits reversing the gloves allowing greater finger freedom and extending glove life.

Catheters for the diagnosis and treatment of internal organs as manufactured by the United States Catheter and Instrument Corp., Glens Falls, N. Y., are being coated with Geon polyvinyl plastic.

A new type of blood pack made by the Fenwal Laboratories, Inc., Framingham, Mass., utilizes Vinylite plastic sheet and tubing. Instructions for use are printed directly on the blood pack. Blood may be stored for as long as 25 days in the new pack.

Revlon Products Co., New York, N. Y., is utilizing two small vinyl wheels on each of its cap tightening machines for nail enamel bottles. Two rotating vinyl discs made from Geon paste resin tighten the bottle caps as the bottles pass between.

Stockholder Group Gains Control

Stockholders of the American Hard Rubber Co., at their annual meeting on April 22 in New York City, voted into power a slate of nine directors sponsored by the Independent Stockholders' Protective Committee, which by and large was made up of the company's larger shareholders. At the same time, stockholders approved the committee's previously announced plan to split the company's common and preferred stocks two-for-one. Of the nine directors supported by the committee, five have never before served on the company's board. They are: A. L. Baker, president of Baker Brothers, Inc., Toledo, Ohio, and a director of the DeVilbiss Co.; Lester Casler, executive vice-president of Eureka Williams Inc., of Bloomington, Ill.; Joel Dean, senior partner of Joel Dean Associates; M. V. Leventritt, attorney; and J. A. Slonim, president of the Stamford Electronics Co., Stamford, Conn. The other four directors are: T. F. Brown, vice-president and a director of National Distiller Products Corp.; A. L. Melhado, financial adviser; J. J. Meliker, president of the New York Furniture Exchange, Inc., and F. A. Sansome, investment counselor. A spokesman for the winning committee said that there will be no drastic changes in management and "as a matter of fact there may be no changes at all."

ACS Honors Geer and Schade

Two former B. F. Goodrich Co. scientists and research directors, Dr. W. C. Geer and Dr. J. W. Schade, have been honored by the American Chemical Society for their 50 years of continuous membership in the organization. Dr. Geer, who retired as company vice-president, now makes his home in Ithaca, N. Y. Dr. Schade is directing the government synthetic rubber research program in Akron, Ohio.

COE SPEAKS ON SYNTHETIC RUBBER AT ANNUAL CCDA MEETING IN N. Y.

Synthetic rubber is one of the outstanding chemical developments of the last decade but its permanent value to America will never be fully realized until it is given the chance to stand trial by free competition, John P. Coe, vice-president and general manager of the Naugatuck Chemical Division, U. S. Rubber Co., said at the annual open meeting of the Commercial Chemical Development Association on March 20 in New York, N. Y.

In a speech accepting the Association's 1952 Honor Award for outstanding work in commercial chemical development, Mr. Coe pointed out that synthetic rubber is ready now to be run by the people in the true spirit of free private enterprise. It is a great chemical development, he said, but it is not commercial. It has never had to pay income taxes or provide dividends for its capital. It is an authentic young man still walking around in a baby's toddler, he said.

Mr. Coe stated that he thinks the industry can walk alone and that he would like to see it tried. But, he opined, you cannot try it free enterprise fashion against a government monopoly. I believe it is time now for the government to get out of the rubber business. The speaker noted that the chemical industry bought the styrene plants and expanded them to make plastics. They established the best possible position from a defense standpoint. The same can be done for synthetic rubber.

Government ownership of synthetic rubber is not due to the obstinacy of government officials but because too many American citizens have forgotten the importance of continuing and strengthening our American system of free private enterprise, the speaker declared. This means we must carry our case not to government officials but directly to the American citizens.

Mr. Coe emphasized the need for an increasing awareness and greater study of people involved in commercial chemical development work. Commercial chemical development, he said, is not all test-tubes and market studies and cost analyses; it is also a problem of people, the unseen element in our programs. We must add to our technical and professional expertness an unselfish interest and, above all, a sympathetic understanding of people.

Flint Joins Factice Group

C. Falconer Flint, until recently associated with the Rubber Service Laboratories of Imperial Chemical Industries, Ltd., Manchester, England, has been appointed director of research of the Factice Research and Development Association, also of Manchester. He succeeds Dr. J. B. Harrison, who relinquished the post to take up other duties. Dr. Flint, a Fellow of the Institution of the Rubber Industry, is a graduate of the Royal College of Science. Before joining I.C.I. he served with the research staff of the Rubber Research Institute of Malaya. He is widely known as the author of "Chemistry and Technology of Rubber Latex."

ACS RUBBER DIVISION HOLDS ITS 60TH MEETING AT CINCINNATI, OHIO

With official registration approximating 750 members and guests, the Division of Rubber Chemistry of the American Chemical Society held its 60th meeting at the Netherland Plaza Hotel in Cincinnati, Ohio, from April 30 through May 2. The meeting featured the presentation of 24 technical papers, a luncheon meeting of the 25-Year Club, a business session, and the usual divisional banquet.

The technical papers ran the gamut of rubber chemistry and technology, and were highlighted by three papers devoted to Hypalon S-2, the new chlorosulfonated polyethylene elastomer developed by the Polychemicals Division of E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware, which covered, respectively, general data, metal oxide curing systems, and organic curing agents. A comprehensive article on the properties, characteristics and potential applications of this new elastomer appears elsewhere in this issue.

Among other subjects covered by the technical papers was a "water bomb" which can produce artificial aging of rubber products 64 times as fast as present methods, improved reclaiming agents for synthetic rubber scrap, the use of radioactivity in measuring thickness of rubber sheeting or rubber-coated fabrics, and the production of hard rubber from latex. Abstracts of all 24 papers presented at the meeting appeared in our March, 1952, issue. Arthur E. Juve (Goodrich) acted as pro tem secretary for the Division at the meeting in place of Charles R. Haynes (Binney & Smith), the regular secretary, who is recuperating from a recent operation.

Active Business Session

In opening the business session, which took place at the end of the technical session on Thursday morning, May 1, Waldo L. Semon (Goodrich), division chairman, first read off a list of the members who had died since the last meeting, and a minute of silence was observed. The list included the following: J. E. Bowers (Piqua Stone Products), C. W. Brees (Goodrich), A. C. Goetz (Eagle-Picher Sales), W. W. Higgins (United Carbon), I. F. Mackey (Sid Richardson Carbon), R. W. Pemberton (American Anode), and H. P. Protheroe (Goodyear).

Dr. Semon then announced that the Executive Committee had given its approval to sponsorship of the recently-organized Fort Wayne Rubber and Plastics Group, the latest of the local rubber groups. Daniel Reahard, Jr. (General Tire), chairman of the group, was introduced and expressed the thanks of the group for divisional recognition. It was also announced that the Executive Committee favored an amendment to the division by-laws providing that in the event either or both of the nominees proposed by any local rubber group for division directors were not approved by the Nominating Committee, the local group concerned would be given an opportunity to present additional nominees. This amendment was proposed and seconded, and was approved by a vast majority.

Attention was called to the fact that the Fall Meeting of the Rubber Division would be held at the Hotel Statler in Buffalo, N. Y., on October 29 to 31, and that three meetings are scheduled for 1953. The 1952 Fall Meeting, like the one held at Cincinnati, will be held apart from the parent society. The first of the 1953 meetings will be held at the Hotel Statler in Los Angeles, California, in conjunction with the 123rd National Meeting of the A.C.S. The regular Spring Meeting will be held at the Hotel Statler in Boston, Mass., on May 13 to 15, and the Fall Meeting at the Hotel Sherman in Chicago, Ill., on September 9 to 11. The latter two meetings will also be held apart from the parent society.

A report from the Membership Committee, given by John J. Hoesly (Goodyear), chairman, indicated that as of April 15 the Division had 2002 regular members and 368 associate members, or a total of 2370. In addition, there were 530 subscribers to *Rubber Chemistry and Technology*, pushing the press run of that journal close to the 3,000 mark.

Howard I. Cramer (Sharples Chemicals), chairman of the Nominating Committee, then submitted the following slate of nominees for the 1952-53 election: *Chairman*, Seward G. Byam (Dupont); *Vice-Chairman*, Raymond B. Stringfield (Fullerton Mfg. Co.) and James C. Walton (Boston Woven Hose); *Secretary*, Charles R. Haynes (Binney & Smith); *Treasurer*, Amos W. Oakleaf (Phillips Chemical). Nominees as directors for two-year terms to represent geographical areas, as proposed by local rubber groups and approved by the Nominating Committee, included the following:

Akron: C. A. Ritchie (Goodrich) and E. L. Stangor (Du Pont); *Boston*, Harry A. Atwater (Hood Robber) and Joseph L. Haas (Hodgman Rubber); *Buffalo*, Charles O. Miserentino (Dunlop Tire) and Edward F. Sverdrup (U. S. Rubber Reclaiming); *Chicago:* Albert E. Laurence (Phillips Chemical) and Vincent J. Lebrecque (Victor Mfg.); *Fort Wayne:* R. C. Knapp (U. S. Rubber) and Calvin S. Yoran (Brown Rubber); *New York:* J. S. Corrigall (Vanderbilt) and G. N. Vacca (Bell Telephone Labs.); *Los Angeles:* R. D. Abbott and George W. Miller (Voit Rubber).

It was also learned that the Executive Committee had appointed a special committee to determine what disposition had been made of all papers presented at divisional meetings during the past five years. The committee, consisting of Arthur M. Neal (DuPont) and C. C. Davis (Boston Woven Hose), will try to determine why some of these papers were never published, either in any of the society's journals or in any of the independent journals.

Meeting of the 25-Year Club

As usual, the first active item on the agenda was the luncheon meeting of the division's 25-Year Club. Presided over by A. C. Eide (American Zinc Sales) as chairman, the meeting was held in the Pavilion Caprice of the Netherland Plaza Hotel, and attracted some 150 members. Several new members were introduced, including the following:

J. C. Moore (Harwick Standard Chemical), F. J. Wehmer (Minnesota Mining), W. S. Rea (United Carbon), H. I. Cramer (Sharples Chemicals), H. S. Karch (C. P. Hall), T. L. Stevens (C. P. Hall), D. C. Maddy (Harwick Standard Chemical), B. S. Garvey, Jr. (Sharples Chemicals), P. F. Niessen (Victor Mfg.), R. S. Havenhill (St. Joseph Lead), and J. J. Rankin (St. Joseph Lead).

In accordance with recently-approved procedure, special honor will be paid to the oldest member present at each luncheon meeting of the club. In this instance, a special memento was presented to Bancroft W. Henderson (American Cyanamid), who first entered the rubber industry in 1906. The presentation was made by E. B. Curtis (Vanderbilt).

It was also announced that the next meeting of the club would be held during the Fall Meeting of the Division at Buffalo, with H. F. Van Valkenburgh, of the Dunlop Tire & Rubber Co., as chairman. E. B. Busenburg, 633 Morelay Ave., Akron 20, Ohio, is the permanent secretary-treasurer of the club, and all correspondence should be addressed to him.

Unexpected Surprise at Banquet

The divisional banquet was held in the Hall of Mirrors at the Netherland Plaza Hotel on Thursday evening, May 1, with 550 in attendance. The program called for an official welcoming address by Mayor Carl W. Rich of Cincinnati. Mr. Rich brought with him two of the several presidential aspirants who were in Cincinnati for scheduled appearances before the League of Women Voters, and after a very brief address introduced both men, each of whom delivered a short talk. The two men were Senator Estes Kefauver and Harold Stassen. It was a totally unexpected treat for the division.

During the course of the banquet, Dr. Semon, who presided, announced that Dr. H. E. Simmons, until recently president of the University of Akron and now associated with the Goodyear Tire & Rubber Co. in an educational capacity, had been selected as the Goodyear Medalist for 1952. Dr. Simmons will deliver the Goodyear Lecture at the Fall Meeting of the Division in Buffalo.

Dr. Semon also expressed the thanks of the officers and members of the Division to the Local Arrangements Committee, and introduced Stewart L. Brams, of the Dayton Chemical Products Laboratories, who acted as general chairman of that committee. Dr. Semon also introduced those seated on the dais, consisting of the officers and directors of the Division, members of the local arrangements committee, and the editors of the two rubber journals. He also read letters from Alden Emery, secretary of the American Chemical Society, and Walter Murphy, editor of *Industrial and Engineering Chemistry*, expressing regrets for their inability to attend the banquet.

The festivities were concluded with the presentation of one of the finest programs

of variety entertainment yet witnessed by the Division at any of its banquets held to date. Whitey Roberts was the master of ceremonies, and also entertained with juggling, rope skipping and story telling par excellence.

Excellent Facilities Provided

The facilities provided for the Cincinnati meeting by the Netherland Plaza Hotel, including the Hall of Mirrors in which both the technical sessions and the banquet were held, were of the finest, and the meals served at both the 25-Year Club luncheon and the divisional banquet were most satisfactory. The hotel is to be congratulated on the excellent cooperation given.

Also to be congratulated are the members of the Local Arrangements Committee who made all the machinery work so smoothly. This committee, in addition to Mr. Brams, included D. N. Bertke (Texo Corp.) as treasurer and J. E. Feldman (Inland) and L. J. Keyes (Dayton Rubber) as members of the steering group.

Chairmen for the various functions included the following: *Registration*—R. J. Hoskins (Inland); *Banquet*—R. B. Feldhaus (Amsco Solvents); *Hotel Arrangements*—S. J. Miller (DuBois); *Special Assignments*—J. T. Poffenberger (Cincinnati Rubber); *Publicity*—C. L. Zimmerman (Zimmerman Co.).

Among others contributing to the functioning of the committee were: D. F. Behney (Harwick Standard Chemical), Harold Bridges (Cincinnati Rubber), Harry Brubaker (Witco Chemical), E. N. Cunningham (Precision Rubber Products), R. S. Naegele (Dow Corning), and James R. Wall (Inland).

Hooper Joins Industrial Rayon

Appointment of Dr. Gilman S. Hooper as manager of high polymer research for Industrial Rayon Corporation, Cleveland 14, Ohio, was recently announced. Dr. Hooper, who joined the company's high polymer research staff in February, 1949, and has been assistant manager of high polymer research for the past year, succeeds Dr. Herman A. Bruson, who has resigned. For the preceding fifteen years Dr. Hooper was associated with E. I. du Pont de Nemours & Co. in the Acetate Division of the Rayon Department. A native of Danvers, Mass., Dr. Hooper received his B.S. in Chemistry from Colby College and M.S. and Ph.D. from Brown University. He is a member of the American Chemical Society, Sigma Xi, and Phi Beta Kappa.

Yates Forms Plastics Company

Robert N. Yates, formerly vice-president and general manager of the Erie Foundry Co., Erie, Penna., has formed the Yates Co. in that city, for the production of extruded plastics. When in production, the company will produce plastic tubes, rods, strips and various profiles through the extrusion rather than through the molding process. The firm will employ, at the start, about 15 persons. Mr. Yates had been with Erie Foundry for 16 years, and resigned to form the new business.

Ross & Roberts Joins Pollak

Effective April 1, the calendered and extruded vinyl plastic film and sheeting manufacturing business heretofore transacted by Ross & Roberts, Inc., at Stratford and West Haven, Conn., will be known as the Ross & Roberts Co., a division of the Pollak Industrial Corp. This action reflects a merger of already existing interests between Henry Pollak, Inc., and Ross & Roberts to facilitate further expansion. Henry Pollak, Inc. has been a leading firm in the distribution and importation of millinery supplies for many years. Dr. Arthur M. Ross and Alvin V. Roberts continue in complete charge of the business of Ross & Roberts and have been named officers and directors of the merged corporation. Ross & Roberts Sales Co. continues as exclusive sales and technical field representatives for Ross & Roberts.

Columbian Plans New Financing

The Columbian Carbon Co., New York, N. Y., is currently negotiating a long-term loan of $20,000,000 from which about 20% will be added to working capital. It is planned to spend approximately 25% in the next 32 months on new manufacturing and processing plants including an operation in petro-chemicals not engaged in heretofore. About 35% will be earmarked for intensive development during the next two years of oil and gas properties and for exploratory research for additional oil and gas. The remaining 20% will be held for standby funds for other projects under study.

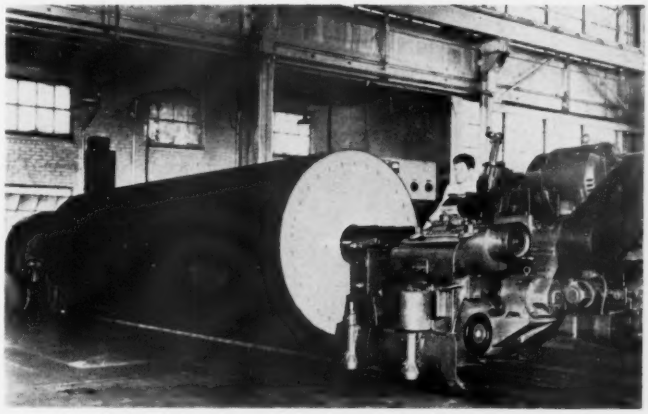
Named Chemical Research Director

Dr. Robert P. Parker has been named director of chemical research for the Calco Chemical Division, American Cyanamid Co., succeeding Dr. H. Z. Lecher, who recently retired. Dr. Parker is a graduate of Williams College, class of 1926, and received his Ph.D. from Yale University in 1933. He came to Calco Chemical as a student trainee and joined the Research Department in 1934. He became a group leader in 1938 and sectional director in the Organic Research Section in 1944. During this period, his work was mainly in the field of dies and pigments. Dr. Parker was appointed assistant to the director of research in 1946 and became assistant director of research of the Pharmaceutical Section in 1947. He is a member of the American Chemical Society and the American Association for the Advancement of Science. Dr. Parker is also a Fellow of the American Institute of Chemistry and the New York Academy of Science.

American Anode Liquidated

American Anode, Inc., formerly a wholly-owned subsidiary of the B. F. Goodrich Co., Akron, Ohio, was liquidated after the close of business on March 31, 1952. Effective April 1, 1952, the business will be carried on under the name of American Anode, a Division of the B. F. Goodrich Co. There have been no change of personnel at American Anode. Dr. R. V. Yohe continues as president and general manager, while R. R. Jennings remains treasurer.

RAYBESTOS-MANHATTAN INSTALLS LARGEST PRECISION ROLL GRINDER



A huge precision roll grinding machine, said to be the largest in the rubber industry, was recently installed at its roll covering plant at North Charleston, S. C., by Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J. Immediately after installation it was used in grinding the largest roll ever rubber covered in the United States, having a 240 inch face and a 60½ inch finished diameter. Designed to meet the expanding needs of the paper industry, this machine is 35 feet long between centers and will grind rolls from 10 inches to 62 inches in diameter and from a 50 inch face to 35 feet between centers. This is an interesting contrast with the small rolls at first made by Manhattan Rubber 59 years ago. Rolls for the paper and textile industries are rubber covered by Manhattan Rubber at plants at Passaic, N. J.; Neenah, Wis., and North Charleston, S. C.

COMMITTEE D-11 SETS SYMPOSIUM ON EVALUATION OF NATURAL RUBBER

Committee D-11 on Rubber and Rubber-like Materials of the American Society for Testing Materials will hold a symposium on "Recent Developments in the Evaluation of Natural Rubber" in conjunction with the 50th Anniversary Meeting of the parent society. The symposium will be held at the Hotel Statler in New York City on Thursday afternoon, June 26, starting at 2:00 P.M. Norman Bekkedahl, of the Rubber Section, National Bureau of Standards, will act as chairman. Abstracts of the papers scheduled, their authors and company connections, follow:

ABSTRACTS OF PAPERS

2:00 P.M. — Introductory Remarks. ***Norman Bekkedahl (National Bureau of Standards, Washington, D. C.).***

2:10 P.M. — Technical Classification of Crude Natural Rubber. ***R. G. Newton (International Rubber Research Board, Welwyn Garden City, England).*** **Paper will be presented by L. Mullins (British Rubber Producers Research Association).** This paper presents a progress report on the developments which have occurred in the twelve months since the last report was made to Subcommittee XII. The supply position has been much improved, and consumers' evaluations have confirmed the value to them of classification by modulus tests. Classification by processibility measurement is still a considerable problem, which will receive discussion in the paper.

Recent world-wide interlaboratory comparisons have thrown light on the problems of standardizing Mooney and modulus testing, and have emphasized the difficulties of standardizing high elongation tests. The information, gained from these comparisons will be related to present standardizing procedures.

The trend in development of future policy concerning T. C. rubber, and of improving the coordination between producer and consumer, will be discussed.

2:45 P.M. — Mooney Viscosity Measurements of Technically Classified Rubbers. ***Rolla H. Taylor (U. S. Department of Agriculture, Salinas, Calif.) and A. G. Veith (B. F. Goodrich Co., Akron, Ohio).*** Mooney viscosity measurements of Technically Classified natural rubbers are essentially in the same state of development as was the Mooney viscosity measurements of GR-S in 1944. We have a machine capable of doing the job. All too frequently, however, the user fails to understand the necessity for strict adherence to operational details if meaningful data are to be obtained. This paper reviews the methods of adjusting and operating the machine. The effects of such things as die closure, calibration, temperature, dimension of parts, and sample preparation are discussed.

The adequacy of any single value of Mooney viscosity as an indication of the processibility of rubber is open to question. It is shown that the various grades of T.C. rubbers break down during mastication at different rates. These rates are apparently related to the proportion and kind of non-rubber materials present. It is suggested that a "processibility index," based on both viscosity and rate of breakdown under some prescribed set of conditions, would be a more useful and meaningful measure of processibility than the original viscosity alone.

3:10 P.M. — Technically Classified Rubber: The Non-Rubber Content and the Measurement of Cure Rate. ***A. G. Veith (B. F. Goodrich Co., Akron, Ohio).*** This characterization has shown that the non-rubber content of a typical set of samples of Technically Classified rubber increases in the order of red, yellow, and blue. Increased quantities of these non-rubber materials appear to promote faster rates of cure. The rate of cure of these samples of T.C. rubber has been measured by several methods, all methods yielding data that are in qualitative agreement.

The application of a new approach to the general problem of rate of cure, as outlined by G. Gee, has been made. Data are presented which indicate that two of the parameters of Gee's equation for the calculation of cure rate are amenable to measurement with the Mooney Viscometer at moderate curing temperatures, when the ACS No. 1 type of mix is employed.

It is suggested that the Mooney Viscometer be given consideration as an instrument for the measurement of cure rate. If it is adopted, a considerable reduction in testing time can be effected.

3:35 P.M. — Vulcanization Characteristics of Natural Rubbers. ***Robert D. Stiehler and Frank L. Roth (National Bureau of Standards, Washington, D. C.).*** Three methods are being considered for the evaluation of natural rubbers. The one advanced by the B. F. Goodrich Co. is based on the change in Mooney viscosity during the initial vulcanization period. This method determines two parameters—a time of incipient cure and the initial rate of cure after vulcanization starts. The second method, proposed by the British Rubber Producers' Research Association, is based on the Mooney viscosity of the compound and the time of cure and value for maximum modulus of the vulcanizates. Two parameters are determined—a rate constant and the maximum modulus. The third method is based on the strain test developed by the National Bureau of Standards. Three parameters are calculated from the strain data—a time of incipient cure, a rate constant, and a structure factor somewhat analogous to the maximum modulus of the second method.

Four rubbers (pale crepe, sprayed latex, smoked sheet, and Tensorub—a high quality smoked sheet produced by Socfin) were evaluated by these three methods. The evaluations were made for two times of storage before vulcanization, two ambient humidity conditions during storage, and two temperatures of vulcanization. The investigation was confined to the standard A.C.S. No. 1 recipe. Measurements were made of the Mooney viscosity of the compound at 100°C., the change in Mooney viscosity with time at 125°C. and at 140°C., the strain at 100 psi, stress at 100%, 600%, and at failure, and the elongation at failure of vulcanizates cured 12, 15, 20, 30, 45, 90, and 180 minutes both at 125°C. and 140°C. The stress at 100% was measured by means of an Instron Tester using strain test specimens.

4:00 P.M. — Quantitative Procedures for the Determination of Dirt in Crude Natural Rubber. ***R. P. Stock (B. F. Goodrich Co., Akron, Ohio), C. O. Miserentino (Dunlop Tire and Rubber Co., Buffalo, N. Y.), C. B. McKeown (B. F. Goodrich C., Akron, Ohio), J. J. Hoesly (Goodyear Tire and Rubber Co., Akron, Ohio), R. T. LaPorte (Seiberling Rubber Co., Akron, Ohio), and G. H. Wallace (Firestone Tire and Rubber Co., Akron, Ohio).*** **(Paper will be presented by Mr. Miserentino).** Subcommittee XII of A.S.T.M. Committee D-11 appointed a task group to study methods of determining foreign material (sand, dirt, bark, etc.) in crude natural rubber. This five-man group provided test procedures and blended samples to six cooperating laboratories for evaluation. The results of this round robin testing program indicate two methods which give reproducible data within practical limits.

Both of the selected methods reduce the solid crude rubber sample to a liquid which can be strained through a 325-mesh screen. The amount of dirt retained on the screen may then be determined. The main differences in the two methods are in the size of sample and in the method of liquifying: (a) A 20 gm. sample is dissolved in solvent; (b) A 454 gm. sample is melted by thermal decomposition using oil as a heat exchange medium and diluent.

It is not within the scope of this paper to examine the usefulness or need for the proposed determinations. However, certain practical problems are presented.

4:20 P.M. — Preparation of a Standard Natural Rubber. ***E. M. McColm (U. S. Rubber Co., Kisaran, Sumatra).*** Various possible methods are discussed for producing a standard natural rubber, and a detailed description is given of the procedure used in preparing a uniform rubber by spraying a bulked lot of creamed formaldehyde-preserved latex. Three test lots of dry rubber from this single lot of bulked latex have been prepared and subsequently tested at the National Bureau of Standards. The data indicated that satisfactory uniformity had been achieved.

4:40 P.M. — Some Aspects of the Testing of Natural Rubber. ***Leslie V. Cooper (Firestone Tire and Rubber Co., Akron, Ohio).*** Many rubber technologists still use tensile determinations on the A.C.S. crude rubber mix as a criterion of quality. To obtain the correct tensile figures certain precautions must be taken to eliminate practices and conditions which tend to give premature breaks. The first part of this paper deals with the technique which is employed at Firestone to get consistent high results.

Much has been written on the evaluation of the effect of exposure to weather

on cured natural rubber and synthetic substitutes. The second part of the paper discusses the design and operation of the Firestone Weathering Machines, which we feel can simulate any single condition or combination of conditions which rubber products may encounter in service. These conditions are: (1) Ozone concentration up to 250 parts per hundred million at normal temperature; (2) Flexing at various speeds up to 150% stretch; (3) Temperature variation from —40°F. to +212°F.; (4) Simulated sunlight as produced by G.E. AH-6 bulbs; (6) Relative humidity from 30% to 100%, and any static stress.

5:05 P.M. — Rubber Evaluations with an Instron Tester. ***S. D. Gehman and R. P. Clifford (Goodyear Tire & Rubber Co., Akron, Ohio).*** An investigation was undertaken to explore new opportunities for the evaluation of rubber from its stress-strain characteristics with an Instron Tester. The resistance strain gage load recording system and the flexibility of control of the crosshead motions introduce a variety of possibilities not available with the usual pendulum type of rubber tester.

Accurate recording of the load-elongation curves for low elongations is of particular interest for many technical applications. Reproducible information histories can be applied readily to test specimens and the effects on load-elongation curves observed. The transient character of the first-stretch load-elongation curve usually used in rubber testing is apparent by comparison with equilibrium curves after repeated cycling. The facility with which such data can be obtained makes use of equilibrium curves feasible.

Load relaxation at constant elongation can be recorded directly. Creep at constant load can also be determined or creep curves may be deduced from the effect of rate of elongation on the load-elongation curves. The low load ranges available and the smooth crosshead motion enable reproducible recording of load-elongation curves for raw rubber and compounds. These results have significance for some phases of processibility.

Use of a small ring-shaped test piece provides an elegant technique for sampling the tensile properties of the rubber in vulcanized rubber articles. Hysteresis may be evaluated by recording the decay of the vibratory load for the free vertical vibrations of a test specimen and attached mass. Or hysteresis determinations can be made over large ranges of amplitude by recording load-elongation cycles and measuring areas. Compressive as well as tensile loading may be used.

Illustrative results from these various procedures are given to point out the versatility and flexibility in testing with this equipment. They indicate important fields of usefulness for it in rubber testing other than routine testing for ultimate elongation and tensile strength for which it is not particularly well adapted.

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SAE-ASTM Meeting Planned

The SAE-ASTM Technical Committee on Automotive Rubber has scheduled its next meeting on June 24, 1952, just prior to the 50th Anniversary Meeting of the American Society for Testing Materials in New York City. Holding this meeting in New York will be a new experience for the group and all are invited to attend.

U. S. Rubber Votes Stock Split

With the largest percentage of stocks represented at a U. S. Rubber Co. annual meeting in over 50 years, stockholders on April 15 voted to re-elect the present board of 20 directors; to split the common stock two shares for one; and to permit the annual meeting to be held either in New York City or New Jersey. The stockholders voted to change and increase the authorized common stock from 2,500,000 shares of $10 par value to 10,000,000 shares of $5 par value, and to change the outstanding common stock from 1,761,092 shares of $10 par value to 3,522,184 shares of $5 par value. U. S. Rubber also announced that it has borrowed $25,000,000 under its loan agreement of $50,000,000 with three insurance companies. The company informed the New York Stock Exchange that the loan agreement calls for 3¼% interest. It becomes due January 1, 1982. Proceeds will go into expansion and working capital to overcome the effects of inflation, the company said.

QUEBEC RUBBER GROUP HEARS REED SPEAK ON "VERSALITE"

Approximately 110 members and guests of the Quebec Rubber and Plastics Group attended the final dinner and technical meeting of the 1951-52 season on April 17 at the Queen's Hotel, Montreal, Quebec, Canada. The meeting was held under the joint auspices of the Society of Plastics Engineers, the Society of the Plastics Industry and the Quebec Group. Principal speaker of the evening was D. W. Reed, assistant sales manager of the Royalite Division, U. S. Rubber Co. Mr. Reed spoke on "Versalite," the Canadian trade name for the thermoplastic material marketed in the United States under the name "Royalite."

Mr. Reed reviewed the background and growth of the product, which he described as a copolymer of butadiene-acrylonitrile and styrene-acrylonitrile. The speaker noted that since its discovery about 12 years ago, new and interesting uses have been found for Royalite. He noted that during World War II, the product found considerable use as a backing board for self-sealing fuel cells.

Also discussed by the speaker were manufacturing processes, fabricating techniques and fabricating equipment required to handle the material. He also considered some of the representative items which have been fabricated of Royalite and its potential uses.

Goodrich Chemical has issued another in its series of Hycar Technical Newsletters. This latest issue covers the "Evaluation of Sterling V-Hycar Compound to Meet Specifications MIL-H-6000 and MIL-H-6017." Ask for Issue No. 4.

MANHATTAN RUBBER HONORS MURAWSKI FOR 20 YEARS OF SERVICE

Members of the group honoring Mr. Murawski are pictured above from left to right: A. W. Beucker, John Carnish, A. H. Woodward (DuPont), F. J. Pechel, Michael Ziga, K. J. Soule, G. L. Hassert, Mr. Murawski, T. E. Russell, J. E. Skane, W. L. White, A. P. Stubbs, J. G. Exel, M. Malkiewicz, S. W. McCune (Du Pont), W. J. Sidor, W. Meeker.

Members of the technical group of the Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J., recently tendered a luncheon to Peter P. "Pete" Murawski, honoring him for 20 years service to the division as a sales representative for the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc. In the light of Mr. Murawski's new assignment on neoprene sales development in the wire field for the entire United States for DuPont, the older members of Manhattan Rubber's technical staff thought it fitting to present Mr. Murawski with a leather brief case as a token of their appreciation.

REPORT ON FOURTH MEETING OF ISO TECHNICAL COMMITTEE 45

The Fourth Meeting of Technical Committee 45 of the International Standardization Organization took place at Balliol College, Oxford, England, from October 1 to 5, 1951. The United States was represented at the meeting by a delegation composed of Dr. R. D. Stiehler (NBS), Miss Ethel Levene (Bureau of Ships), Dr. H. C. O'Brien, Jr. (Royston Laboratories), and R. S. Havenhill (St. Joseph Lead). Dr. Stiehler served as leader of the delegation.

At the meeting, five draft proposals were approved for submission to member countries for ratification. These are: (1) Tension Stress-Strain Testing; (2) Tear-Strength Testing; (3) Hardness Testing; (4) Rubber-to-Fabric Adhesion; and (5) Abrasion Testing with the DuPont Abrader. A report on these follows:

Approved Draft Proposals

Tension Stress-Strain Testing (Document 133)—This proposal permits the use of either ring or dumb-bell specimens. Insofar as dumb-bell specimens are concerned, it is in conformance with ASTM Method D412, except for temperature of test which is 20 ± 2° C. This temperature is used in international standards and if it is desired to change it, the subject should be discussed from the point of view of all ISO/TC45 Standards rather than individually. It should also be mentioned that dumb-bells either 6-mm. or 0.25 inch in width can be used. The French use a 6-mm. specimen and if the width is considered in the calculations, the small difference between it and the 0.25-in. specimen should not significantly affect the results, the committee stated.

Tear-Strength Testing (Document 101)—This method standardizes only the crescent-shaped specimen. In general, it conforms to ASTM Method D624. The thickness of the specimen, however, is limited between 0.07 and 0.11 inch. Further study will be made of other types of specimens.

Hardness Testing (Document 118)—This proposal was approved with the proviso that this property be defined as International Rubber Hardness Degrees. This scale is approximately the same as that in ASTM Method D676. Interesting instruments were seen at Croydon both of the hand and bench types that were calibrated in International Rubber Hardness Degrees. Consideration should be given to revising ASTM Methods D314, D531, and D676 to see if they can be brought in line with the International Standard. It may thus be possible to resolve the repeated controversy on this subject, Technical Committee 45 stated. Considerable interest was shown in the hardness tester developed by Pirelli for very small specimens. The Netherlands, Switzerland and United Kingdom delegations will study it.

Rubber-to-Fabric Adhesion (Document 121)—It is believed that this proposal is in accord with ASTM Method D413; however, further study on the subject by the appropriate committee will be needed. The U. S. delegation agreed at the previous meeting in Akron to supply information on the condition of synthetic textiles. This information was not available at the Oxford meeting, but is still desired by the committee.

Abrasion Testing with the DuPont Abrader (Document 99)—There appeared to be interest in the standardization of the DuPont Abrader so the U. S. delegation offered no objection. It was emphasized, however, that no laboratory test for abrasion was worthy of standardization at the present time.

Also discussed at the meeting was the matter of rubber-to-metal bonding. It was decided that further work would be required and a working party consisting of France, the United States, and the United Kingdom was established.

Low-temperature properties were also considered at the meeting. Mr. Havenhill discussed the progress that has been made in the United States and Miss Levene discussed the practice of the Navy Department in regard to tests for the low-temperature properties of rubber vulcanizates. It was agreed to consider at the next meeting tests for (1) the change in modulus with temperature, (2) brittleness, and (3) crystallization effects.

Delegations to the meeting were requested to study the problem of flex-cracking and crack growth still further, so that an appropriate test may be considered at the next meeting. The United States delegation was requested to supply six piercing tools and jigs to the United Kingdom delegation who will distribute them together with specimens for tests to the various delegations.

On the question of latex, a proposal was accepted as provisional for the mechanical stability of latex. In this test, it was agreed to dilute the latex to 55% solids, and to use 1.6% ammonia solution for this purpose. Pending the completion of the study of plastic containers in the United States, no change was made in the dimensions of the container. It was agreed to specify that the speed (14,000 ± 200 r.p.m.) should be checked while a test is in progress.

It was also agreed to permit either the ASTM or BSI methods of detecting the end-point for routine tests. For referee tests, it was decided to determine the end-point by straining the latex through 80 mesh (dimensions of openings to be specified later) stainless steel gauze and ascertaining the time required to form 0.5 gram of dry coagulum. The French prefer to use a rotor 21 mm. in diameter instead of 20.8 mm. They are investigating the effect of rotor diameter.

Test for KOH Number

There was also considerable discussion on the test for KOH number. Because of conflicting experience of various delegations, it was decided to study this test further. It was also agreed that further work should be done on a test for zinc oxide stability. In this connection, it was suggested that a zinc complex (e.g., zinc acetate) may be more suitable than zinc oxide for test purposes. Further work on sampling of latex was indicated and a working party was formed consisting of France, Netherlands, U. S. A., and United Kingdom.

On the classification of vulcanized rubber, the Netherlands delegation advanced arguments for the superiority of their standard to the ASTM standard. After lengthy discussion, it was decided to set up a working party consisting of Italy, the Netherlands, the U. S. and the United Kingdom to further consider the problem.

On the basis of reports from the various delegations, it was agreed that rubber specimens should be aged in individual containers. If individual containers cannot be used, then specimens might be aged together provided they were made from: (1) polymers of the same general type, (2) the same type of accelerator, and (3) the same type of antioxidant.

A working party was set up to prepare proposals for aging ovens of the cell or individual container type. This group comprises France, Italy, Netherlands, Switzerland, U. S. A., and United Kingdom. The progress made in this direction in the United States was discussed and at the request of the delegations, the draft proposal now being considered by ASTM Committee E-1 was submitted as an ISO/TC45 Document for the use of the working party.

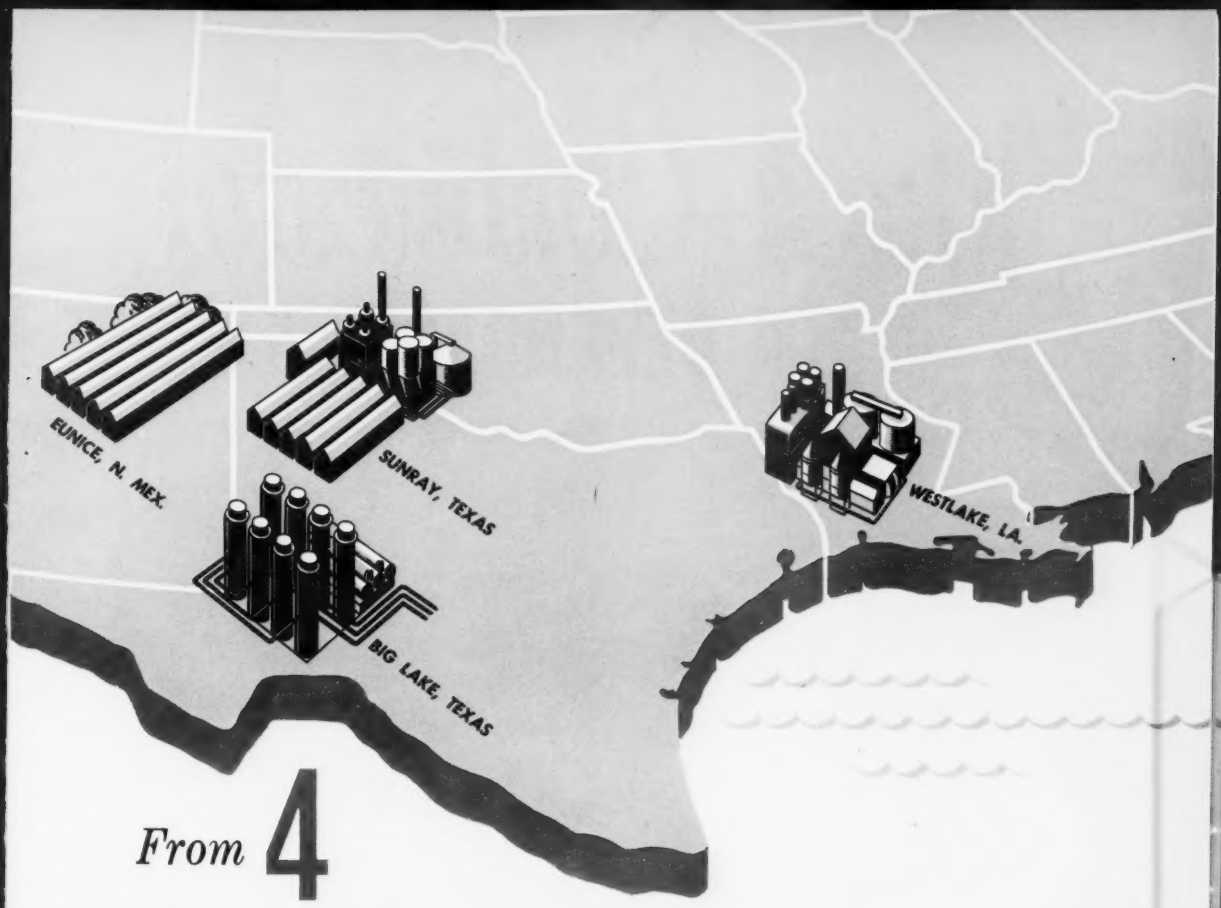
It was agreed that further work is required before a draft proposal on dynamic testing is prepared. From the discussion, it was evident that such tests should be made at three or more frequencies and at three or more temperatures. Considerable advance would be made if agreement is reached on what these frequencies and temperatures should be. It was felt that the NBS inter-laboratory test on polyisobutylene should be helpful in choosing the correct type of test.

Classification of Hevea Rubbers

The many problems involved in the classification of Hevea rubbers led to the establishment of a working party consisting of France, Netherlands, U. S. A., and United Kingdom. Sampling still remains a problem but no proposal was advanced on which action could be taken. In discussions on the determination of the Mooney viscosity, it became evident that additional standardization of rotors and dies are required.

The United States delegation agreed to ask Subcommittee XXVI of ASTM Committee D-11 to prepare the revised specifications. In this connection, several delegations had examined smooth rotors and would like to see them adopted. As an interim procedure, it was agreed to prepare specimens for the viscosity test by passing them 6 times through the rolls (preferably with the same speed) of a laboratory mill with a distance between the rolls of 2.5 mm. The size of the rolls and temperature of the surface was not specified at this time.

It was pointed out that even-speed mills are not common in the United States and that the usual ratio between the speed of back and front rolls is 1.4. These unsettled points were referred to the working party. It was also decided to continue to read the viscosity after one minute of preheating and four minutes of shearing in the Mooney viscometer. It was recommended that the specimens and rotors be



From **4**

Witco-Continental Plants . . .

A COMPLETE LINE OF CARBON BLACKS

FURNACE BLACKS

Continex SRF, SRF-NS

Continex HMF

Continex HAF

Continex FEF

CHANNEL BLACKS

Continental AA (EPC)
Witco No. 12

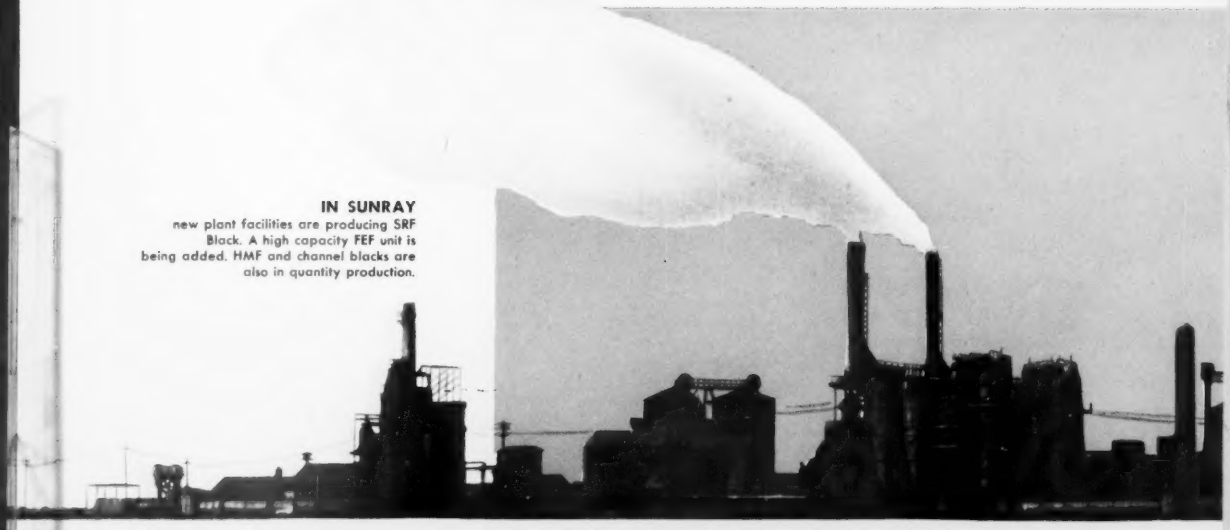
Continental A (MPC)
Witco No. 1

Continental F (HPC)
Witco No. 6

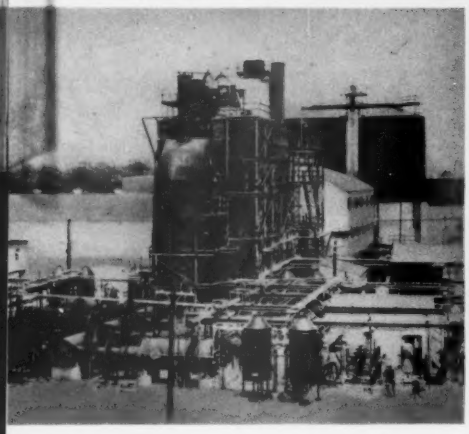
Continental R-40 (CC)

Witco-Continental

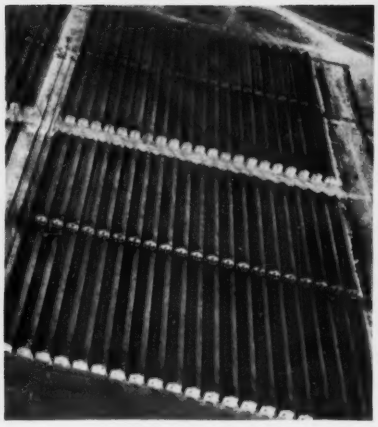
A DEPENDABLE SOURCE



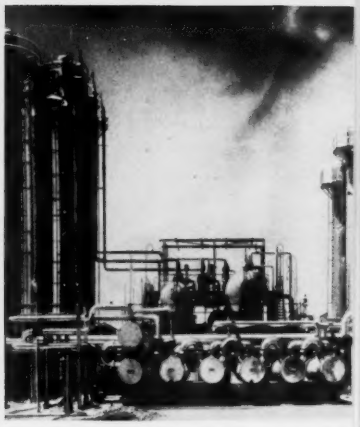
IN SUNRAY
new plant facilities are producing SRF Black. A high capacity FEF unit is being added. HMF and channel blacks are also in quantity production.



IN WESTLAKE
Witco-Continental's new plant is in full-scale production of HAF Black. These facilities are being expanded, and production will be almost doubled this year.



IN EUNICE, N. M.,
hundreds of acres of channel black burner houses produce a complete range of channel blacks.



AT BIG LAKE, TEXAS,
Witco's natural gas plant produces channel blacks from residual gas.

Both plants are located at points where natural gas is still available at moderate cost, assuring customers of a continuous supply at reasonable prices.

OF SUPPLY

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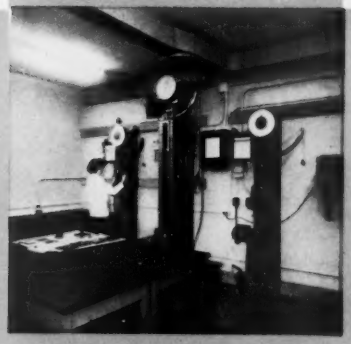
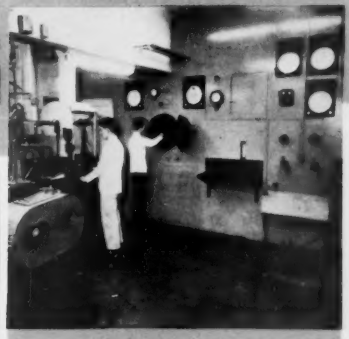
Sectional view of mill room showing compounding of rubber test batches.



Scott Testers for evaluation of rubber compounds; center machine for elevated temperature tests.



Sectional view of laboratory mill room showing rubber mills, open steam vulcanizer, curing presses.

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predicated. In order to grade more rubber, it was agreed to make only one determination on a sample.

It was agreed to continue the use of the ACS No. 1 recipe and to have each laboratory adopt a mixing schedule which will give an average value of 40 for the Mooney viscosity of the mixed compound. This procedure was considered as a temporary expedient in view of the lack of standardization in mills, etc. The United States delegation agreed to go along on a temporary basis but felt that quicker and better standardization could be achieved through the use of a standard sample of natural rubber.

It was recommended that the compound between mixing and curing be stored in a closed container of restricted volume for not more than 72 hours prior to vulcanization. The working party is to investigate the mixing, storage and curing conditions further to see if better standardization can be achieved. It is proposed to measure stress at 100% elongation or strain at 5Kg/cm². These two values are mathematically related and can be converted from one to the other.

It was agreed to place copper and manganese in natural rubber on the future program and the working party on the classification of natural rubber was requested to include this subject in their assignment. A working party on terms and definitions was established comprising France, Netherlands, U. S. A., and United Kingdom.

It was agreed to include compression set and electrically conducting rubber on the next agenda. The United States delegation requested that dynamic testing be postponed until a future agenda and be omitted from that for the next meeting. It was also agreed to hold the next meeting in Paris, France, sometime during the spring of 1953.

Binney & Smith Statex 125

Binney & Smith Co., New York, N. Y., has introduced Statex 125, which is termed a super-abrasion furnace black (SAF) by the company. Statex 125 is said to provide abrasion resistance and reinforcement surpassing the HAF blacks. In natural and synthetic rubbers, Statex 125 evidences higher tensile and hardness with lower rebound and Log R as compared with HAF black, indicative of its finer particle size. Modulus is of the same order as for the HAF blacks. The company states that a comparison of suitably compounded Statex 125 with HAF carbons in cold GR-S (LTP) and natural rubber for factory processability indicates approximate equality as regards mixing temperatures and viscosities developed. The curing rate and under cure set-up for the compounds with Statex 125 are almost identical with the compounds with HAF carbon. Cold rubber compounds with Statex 125 and Statex R were made into 7.60 x 15 passenger tires and road tested in Texas. Statex 125 showed 125% the abrasion of the Statex R control after 22,000 miles. Cracking and chipping were essentially equal. Other investigations have established a similar order of superiority in wear for Statex 125 over HAF carbons.

Minnesota Mining Promotes Walton

Dr. Charles W. Walton

Dr. Charles W. Walton, associated with the Minnesota Mining & Manufacturing Co. since 1947, has been appointed general manager of the Adhesives and Coatings Division of the company. Dr. Walton first served as assistant to the executive vice-president in charge of manufacturing. In 1948, he organized and became general manager of the company's New Products Division. Dr. Walton received his doctorate in physical and colloid chemistry from the University of Michigan in 1933. He then joined the Goodyear Rubber Co. where he was assigned to synthetic rubber research. During World War II, he headed a technical coordinating group within Goodyear to facilitate the flow of information on synthetic rubber problems among government agencies and other cooperating companies. Dr. Walton is president of the Commercial Chemical Development Association and a member of the American Chemical Society.

H. O. Canfield Promotes Wyman

Ralph M. Wyman, assistant vice president of the H. O. Canfield Co., Bridgeport, Conn., has been appointed assistant general manager of the company and vice-president of its subsidiary, the H. O. Canfield Plumbing Supply Co. Mr. Wyman joined the Sales and Scheduling Department of the parent organization in May, 1948, and later that year was transferred to its New York office as manager of the Customer Service Department. In 1949, he was appointed assistant to the vice-president and in 1950 was made manager of industrial sales in charge of orders, quotations and scheduling. In September of that year he also assumed responsibility for defense production. He became assistant vice-president of the company on May 1, 1951.

Grand Prairie Changes Name

Grand Prairie Rubber Co., Inc., has moved its place of business from Grand Prairie to Arlington, Texas, and changed its company name to the Oil States Rubber Co. The capital stock of the company has been increased to $175,000 from $25,000.

PNEUMATIC FARM TIRE GROWTH CITED IN LITCHFIELD REPORT

The pneumatic farm tire, now a standard item of agriculture equipment in most parts of the world, made its official debut only 20 years ago, P. W. Litchfield, chairman of the board of the Goodyear Tire & Rubber Co., recalls in his current Notes on America's Rubber Industry, New Series No. 17 entitled "Modern Farm Miracle: 1932-1952." It was in 1932 that an implement manufacturer first offered pneumatic tires as optional equipment on a farm tire, Mr. Litchfield writes. This was Goodyear's "all-weather" diamond tread tractor tire, developed after two years of experimentation, first in Florida's citrus groves and then on ploughed and irrigated soil.

This innovation on the part of the rubber industry paved the way for the modern farm miracle that in the short span of two decades has revolutionized agricultural methods, Mr. Litchfield points out. So it was that 20 years ago the plodding stage of agriculture was brought to a close, he continues. The rubberization era of the farm began. No segment of transportation ever has been so evolutionized so rapidly, he states.

The Goodyear chairman noted that just as the pneumatic tire furthered the development of the early automobile, the farm tire increased the usefulness of the tricycle type all-purpose tractor which had been introduced around 1924, and provided the impetus that changed the modern course of the farm implement industry.

Mounted on low pressure rubber tires instead of iron rims, the tractor of 1932 could speed up field operations as much as 25 to 50%. The tractor's power was increased 20 to 25% and the rubber tires affected a saving up to 25% on fuel consumed, he points out.

The American farmer was won over immediately to the pneumatic tractor tire, Mr. Litchfield relates, and it was inevitable that rubberization of all farm equipment would follow. Use of the pneumatic tire enabled implement manufacturers to design lighter and lower cost equipment which accelerated farm mechanization.

The number of tractors in use has increased by 2,652,000 in the past 17 years, farm trucks by 1,610,000 and farm automobiles by 2,358,000. The usefulness of the horse as a farm animal began to decline with the increased use of tractors and trucks, and by 1950 there were more of these vehicles on the farm than there were horses.

The modern farm miracle has been this vast mechanization program which today, in the face of less fertile soil and decreasing farm labor, enables America to feed adequately her increasing population and provide food for less fortunate nations in time of peace as well as during world strife, Mr. Litchfield adds.

Improved cultural practices and other factors have contributed to higher crop yields, but it has been the combined mechanization and rubberization programs plus increased activity in soil conservation that have provided the keystone for this satisfactory performance of farm productivity, Mr. Litchfield concludes.

C. I. C. RUBBER CHEMISTRY DIVISION SCHEDULES JUNE MEETING

The Rubber Chemistry Division of the Chemical Institute of Canada has scheduled a series of interesting papers to be presented at its June Conference Program which will be held on Wednesday, June 4th at the Mount Royal Hotel, Montreal, Que., Canada. Speakers from both the United States and Canada will address the meeting. Eight papers will be presented in a morning and afternoon session, with a business meeting scheduled for 11:30 A. M. Abstracts of the papers, their authors and company connections, follow:

ABSTRACTS OF PAPERS

Wednesday Morning

9:30 A.M. — The Evolution of the Inner Tube. ***William E. Ireland (B. F. Goodrich Rubber Co. of Canada, Kitchener, Ont., Canada).*** Abstract not available.

10:00 A.M. — Trace Elements in Natural and Synthetic Rubbers. ***A. R. Dabald (Dominion Rubber Co., Ltd., Montreal, Que., Canada).*** Like most biological products natural rubber contains trace elements. Irrigation, creping and various purification methods add to the trace metal content. Coagulants may add trace metals to synthetic rubbers. Compounding ingredients are another major source of metal contamination. Some forms of trace metals are harmful and some show little or no effect.

The major deterioration induced by the presence of harmful trace metals is associated with oxygen absorption by raw and vulcanized rubbers, but, as is pointed out in this paper, many are the ways in which absorbed oxygen alters rubbers. However, from a practical point of view it is the deterioration of physical properties of rubbers that is the major concern of the rubber formulater and manufacturer. We might almost narrow it down to the fall off of physicals due to oxidative scission of the polymer chains.

Review is made of the mechanism of oxidative degradation of aromatics and of simple monoolefins, and the parallelisms found in oxidation of rubbers are outlined. The presence of certain trace elements has a marked effect on this mechanism and the manner in which autooxidation is altered suggests methods of deactivating undesirable trace metals. The assistance antioxidants give in such a scheme is likewise reviewed.

10:30 A.M. — The Influence of Chemical Rubbers on Winter Driving. ***N. S. Grace and G. Winter (Dunlop Tire and Rubber Goods Co., Ltd., Toronto, Ont., Canada).*** The emergency of the last war first introduced chemical rubber tires to the public who were critical of their deficient traction on ice and snow. Many investigators have studied this problem both in the laboratory and the field. With the variety of winter conditions that may exist evaluation becomes very complex. Field tests with vehicles add to the complexity but are favored because of the difficulty of translating laboratory frictional values into road performance or user reaction. The work of the National Safety Council (U.S.A.) is reviewed to illustrate some of the results of careful measurement of the ability to stop and to go under a variety of conditions.

A relatively simple field method of evaluation requiring no expensive equipment has been developed and is described. High precision is not claimed but it has served as a useful guide in evaluating what the public's reaction might be to a variety of tire tread compounds.

The original GR-S has been compared with newer chemical rubbers; also blends with natural rubber, using natural rubber tires as controls. The conclusion is reached that among the newer chemical rubbers of improved characteristics now available, the gap in winter traction that existed between the original GR-S and natural rubber has been substantially reduced.

11:00 A.M. — Butyl Rubber in Mechanical Rubber Goods. ***E. D. Jackson (Stokes Division, General Tire & Rubber Co. of Canada, Ltd., Welland, Ont., Canada).*** Butyl rubber, which has been widely used for the manufacture of inner tubes for motor vehicle tires, has been found to be useful for the production of various types of mechanical rubber goods. The Butyl rubber used in these products is of the type having a high curing rate and a Mooney viscosity in the range of 70 to 80.

The excellent resistance to deterioration by sunlight of properly compounded and processed Butyl rubber, makes it a desirable material for rubber goods which are exposed to sunlight in service.

Intricate extrusions may be made of Butyl rubber compounded with FEF carbon black and relatively large proportions of liquid plasticizers. These extrusions hold their shape and sag very little in open steam cures, even in fairly low hardness compounds. For rubber goods to be exposed to elevated temperatures in service Butyl rubber has been found to be very satisfactory when compounded in the correct way. It may be compounded to produce materials having low compression set characteristics.

A very satisfactory procedure has been developed for mixing Butyl rubber compounds containing large proportions of liquid plasticizer, by which the carbon black is dispersed to the degree required for maximum resistance to sun cracking.

It is felt that as more is learned about the properties of Butyl rubber compounds, this material will be used for the manufacture of an increasing number of different types of mechanical rubber goods.

11:30 A.M. — Business Meeting.

Wednesday Afternoon

2:00 P.M. — The Electrostatic Properties of Plastics. ***H. A. Endres and W. T. Van Orman (Goodyear Tire and Rubber Co., Akron, Ohio).*** This paper will review the development of electrostatic charges in rubber and the phenomena accompanying electrostatic discharge. The relationship of the electrostatic properties of materials to surface resistivity, the effect of relative humidity, and the influence of chemical composition (polarity) will be discussed. The mechanism of dust collection on plastics due to electrostatic charges and the use of destaticizing treatments will be described. The utilization of this troublesome property of plastics in self-charging electrostatic air filters for removing highly dispersed particulate matter from the atmosphere will be discussed.

Air filters composed of electrostatic materials in suitable form offer an economical means of removing dust, soot, and smoke from the air when used in conventional forced draft heating, ventilating and air conditioning systems. Such filters function by electrostatic attraction and precipitation and are therefore effective throughout their entire thickness. They are easily cleaned and can be re-used without deterioration of their electrostatic properties.

2:30 P.M. — The Errors of Stress-Strain Testing. ***S. T. Bowell and I. C. Rush (Polymer Corp., Sarnia, Ont., Canada).*** The physical tests specified for grading general purpose synthetic rubber include determinations of tensile strength, elongation at break, and modulus at 300% extension at different times of cure. For many years it has been suspected that the errors associated with these measurements, even when the tests were conducted by a rigidly specified procedure, were so large, compared to probable variations occurring in the quality of the lots, that the tests were of little value.

A co-operative program between the Polymer Corporation and the Department of Mathematical Statistics of the Ontario Research Foundation was carried out to determine the magnitude of the errors of the tests and to determine the contribution of each step in the procedure to the total error of the final result. In this paper the magnitude of the component of final test error introduced by each step is listed together with the precautions employed at each step to hold test variability to a minimum.

It is pointed out that the errors for each test are so great and particularly so unpredictable that the results should not be used as a basis for action such as rejection of a lot or blending of several lots.

3:00 P.M. — Elastomeric Products From Thiokol Liquid Polymers and Ethoxyline Resins. ***J. S. Jorczak (Thiokol Corp., Trenton, N. J.).*** Among the newest resin developments a very versatile class is the ethoxyline resins. Several commercial grades have been used successfully with Thiokol liquid polymers. The interaction occurs by addition. There is no by-product and very little shrinkage occurs. Liquid polymers of low viscosity can be converted to rubberlike semi-rigid and rigid (non-brittle) compositions. The products have exceptional properties for use as adhesives, embedment compounds and coating compounds. The liquid mixtures will convert at temperatures ranging from 40°F to 150°F. The reaction is exo-

thermic. Control is maintained by choice of catalysts which vary in activation effect.

3:30 P.M. — Truck-Bus Tires Today. ***H. T. Humby (Firestone Tire and Rubber Co., Ltd., Hamilton, Ont., Canada).*** This paper is of general interest in that it discusses practical suggestions for lower cost operating of truck and bus tires. Such matters are discussed as tire cost per mile; how retreading can reduce cost per mile; the functional ability of a tire to carry load; what is meant by overloading a tire; inflation pressure and its effect on mileage; the relation of inflation pressure to speed and terrain; body strength—the evolution of rayon in truck tires; selecting tires for lowest cost per mile, and rims and their effect on tire life.

Cabot Processing Wollastonite

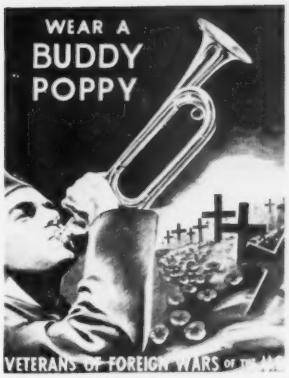
Cabot Minerals, a division of the Cabot Carbon Co., subsidiary of Godfrey L. Cabot, Inc., Boston, Mass., has begun a large-scale quarrying and grinding operation to bring wollastonite to industry. A calcium metasilicate, wollastonite is recommended for use in paints, dielectric ceramics, floor and wall tile, welding rod coatings, alloying agents, and soil conditioners. The new Cabot Minerals Division project, when completed, will represent an investment of $2,000,000, and production will be approximately 60,000 tons annually. Reserves in the deposit bordering Lake Champlain at Willsboro, N. Y., are conservatively estimated at 15,000,000 tons. Wollastonite is a pure white, natural mineral of nearly theoretical purity and remarkable physical and chemical uniformity. Its most outstanding properties are its brilliant whiteness, its uniformity and fibrous nature. In special fiber grinds, the fiber length may be 13 to 15 times the diameter. By varying grinding methods, it may also be reduced to very short fiber particles. Wollastonite is unique, in that it is the only white, wholly fibrous mineral in the mineral filler price range.

United Engineering Stock Split

The board of directors of the United Engineering and Foundry Co., at a special meeting held on April 29, acted upon the plan of increased capitalization approved recently by the shareholders, and authorized a common stock split in the form of a stock dividend. Common stockholders as of record May 9 will receive on May 20 two additional shares of $5 par common stock for each share held as of the record date. The total par value of the additional stock issued will be transferred to capital from surplus account. As a result of this action, the number of $5 par common stock will increase to 2,496,708 from 832,236 shares.

Spadone-Hoag Changes Name

Effective May 1, 1952, the name of the Spadone-Hoag Corp. has been changed to the Spadone-Alfa Corp. The firm maintains its headquarters at 10 East 43rd St., New York 17, N. Y. The telephone number is MUrray Hill 2-5525. Spadone-Alfa manufactures oilless bronze bearings for industry.



Schedule Gordon Conferences

The Gordon Research Conferences, sponsored by the American Association for the Advancement of Science, will be held from June 16 to August 29 at the Colby Junior College, New London, N. H., and the New Hampton School, New Hampton, N. H. The Section on High Polymers will be held from July 7 to July 11, with Dr. P. J. Flory as chairman and Dr. A. V. Tobolsky as vice-chairman. Fourteen papers will be delivered, as follows:

Recent Developments, by H. Mark.

Ionic Copolymerization, by P. H. Plesch.

Subject to be Announced, by C. S. Marvel.

Popcorn Polymerization, by T. G. Fox, Jr.

Rates of Initiation in Vinyl Polymerization, by A. V. Tobolsky.

Synthetic Polypeptides: Their Preparation, Structure and Relationship to Proteins, by C. H. Bamford.

Crystallization of Polyethylene, by R. S. Stein and S. Krimm.

Studies of Rapid Crystallization in Polymers, by W. H. Cobbs, Jr., and R. L. Burton.

The Drawing of Terylene, by R. F. Tuckett and A. B. Thompson.

Polymer Diffusion and Its Measurement, by F. T. Wall.

Thermodynamics of Polyelectrolyte Solutions, by H. Eisenberg.

Light Scattering and Intrinsic Viscosity of Copolymers and Branched Polymers, by W. H. Stockmayer.

Some Physical Properties of Concentrated Solutions of Polyisobutylene, by T. W. DeWitt.

Relaxation Distribution Functions of Polymers and Their Concentrated Solutions and Gels, by J. D. Ferry.

Names New Pacific Coast Agent

Charles T. Wilson Co., Inc., New York, N. Y., has named the R. D. Abbott Co., 5107 Anaheim Telegraph Road, Los Angeles 22, Calif., as sales representatives for the Pacific Coast area. The firm was formerly represented on the Pacific Coast by Reinke & Amende, Inc., of Los Angeles. This latter firm has relinquished its activities in rubber to devote full time to other interests.

RECONSTRUCTION FINANCE CORP. MODIFIES GR-S IDENTIFICATION

As a result of further discussions with various members of the rubber consuming industry, the Reconstruction Finance Corporation has made certain changes and modifications in the over-all plan set forth for the revision in identification of GR-S synthetic rubbers. The original memorandum, released on March 10, set down new designations for polymers to be offered for sale July 1. The complete story and the new RFC designations for polymers currently in use appeared in the April, 1952 issue of RUBBER AGE.

RFC has now acted to modify the original order because of a more satisfactory outlook in the supply and demand picture. Therefore, under the new system, it will not be necessary to use an activated recipe in the polymerization of hot rubbers. RFC will continue to use potassium persulfate as the catalyst, and hydroquinone as the shortstop in the production of hot rubbers, according to the new directive.

It has also been announced that further consideration has indicated the advisability of certain specific changes. Polymers 1503 and X-682 will be produced with a bound styrene of 23½%. Polymer 1702 will contain a slightly staining stabilizer instead of a non-staining stabilizer. Polymer 1017 will be coagulated by glue-acid instead of salt-acid. The Mooney viscosity of latex 2001 will be lowered to 33 ML-4.

In accordance with industry requests, RFC will now identify the types of HAF carbon blacks, non-staining antioxidants and processing oils incorporated in the polymers. The identification will be made on the quality report which accompanies each shipment and in addition, will appear upon all paper bags containing the rubber. In the case of bareback shipments of carbon black masterbatch, the identification will be embossed on the bale. The following codes of identification will be used and such letters will appear as a suffix to the polymer numbers:

Non-Staining Stabilizers: Polygard—P; Wingstay S—W.

HAF Carbon Blacks: Philback O—O; Aromex—A; Vulcan 3—V.

Processing Oils: Circosol 2XH—C; Sundex 53—N; Shell SPX 97—L; and Dutrex 20—D.

For example, 1006 containing Wingstay S will be identified as 1006-W. In the case of oil-black masterbatches, the first letter following the polymer number will indicate the oil incorporated, and the second letter will indicate the carbon black. For example, 1800 containing Sundex 53 and Philback O will be identified as 1800-NO.

It should be understood that RFC identifies these polymers for information only. No orders for polymers specifying certain antioxidants, HAF blacks or processing oils will be accepted by the government agency. All purchase orders should specify only the basic code number and RFC will ship, from production or inventory, according to basic code numbers, without regard to suffixes.

INDUSTRIAL OVENS OPENS NEW COATING RESEARCH LABORATORY

A technological development which has already been recognized as being of major significance to the rubber and plastic industries was highlighted on February 25 when a new coating research laboratory at the Industrial Ovens, Inc. plant in Cleveland, Ohio, was formally opened. The actual opening was preceded by a week-long open house attended by more than six hundred engineers, research technicians, process engineers and operating executives of the rubber and plastics coating industry.

The laboratory and its equipment, which have been in the process of design and construction for a period of two years, occupy a separate building devoted exclusively to laboratory and process development work. The laboratory's research facilities include mixing, coating and embossing, measuring and testing equipment. Production of pilot or test samples can be processed in lots ranging from laboratory-size batches up to production runs of 40% of large plant operation.

The laboratory has been established with several fundamental objectives in view. Primarily, the scope of its operation is to center about immediate and long range investigations regarding the application of synthetic and natural rubber and latices in various solutions or suspensions. The mechanical problems involved in applying these materials to webs or strands, by various methods, will be studied from the research and practical-science point-of-view. Short and long range studies are to be engaged in to determine the effects of compound changes in the quality of rubberized fabrics for many different types of products.

Considerable work will be undertaken in studying the economic factors of fabric coating. Emphasis will also be placed on problems of heat transfer, surface conditions and methods of solvent evaporation in relation to fuel costs.

In the fields of coating with plastisols and organosols various studies will be engaged in relating to coating head design, coating roll arrangement, ratio of viscosity to roll gap, the effects of diluents and solvents and other related factors. The entire field of roller coating is to be thoroughly explored and properly analyzed with the progress and advancement of the entire coating industry as the ultimate objective.

In this view of the laboratory, the Multizone fuser and evaporator is shown in right background. Coating equipment is seen in center background, with continuous feed and constant tensioning units to its left.

Empirical research will also be undertaken in the fields of continuous embossing of films, foils, papers and fabrics. Relationships of coating material temperatures, roll diameters and pressures are to be established and recorded for a wide range of operating speeds and conditions.

Experimental work with synthetic and natural fabrics and fibers, will be done to determine the full effects of attenuation on these materials. The effects of temperature, time, tension and twist of cord upon proper load strain characteristics will be analyzed. Effects of humidity and regained moisture on fabrics and cords will likewise be evaluated. Coating material viscosity and its relationship to coating method, speed, surface tension and flow-out characteristics during actual coating operations will also be actively studied and determined.

Industrial Ovens' laboratory is completely equipped with compounding and mixing equipment for compounding materials from laboratory batches up to and including fifteen gallon lots. The project's facilities include accurate laboratory and pilot plant weighing and measuring equipment.

The coating line is a complete, one-third-actual-size model of a prototype continuous universal coating line. It embodies a continuous feed for any web material and constant tension web feed ahead of the coating head. The web is opened to full width and centered ahead of the coater.

The coater is a standard 28 inch width, 101 universal precision coater providing for reverse roll coating, solution coating or impregnating as well as a full range of knife coating operations. The relationship of type of coating to fabric or paper and coating material will also be investigated. Electronic gauging and oscilloscope measuring are to be employed. High ten-

Shown above is a view of the new coating research laboratory recently opened by Industrial Ovens. The coating end of the laboratory's one-third size pilot coating line is shown in center background. Merle F. Schreurs, manager of the new laboratory, is shown at the extreme right, at desk, discussing a research problem with two visiting research engineers.

sion padding rolls are used to remove excess dip solution and to control impregnation weights. The system employs a multizone evaporator and fuser with temperature ranges to 700° F., under separate temperature, humidity and convection air velocity control.

Water cooled, low pressure embossing and polishing equipment with a wide range of pressure adjustments is also incorporated. Deep engraved and unit pattern embossing rolls are provided. Continuous cooling equipment is employed. After cooling, edge alignment and expanding devices prepare the fabric for final continuous takeup on center windups.

The main system drive for web materials is a special electrical drive using both variable voltage and electronic current control for speed and tension control. Four separate independent tension zones allow investigations of different tension levels at various stages of the coating operations.

IOI's research and development laboratory is fully equipped with all physical testing and chemical compound equipment, including such units as analytical balances, beta ray gauges, autographic strain gauges, rotary abrasion testers, brittle point tester, microscopic comparators, test potentiometers, viscosometers and dynamometers. It also possesses a complete array of mixing, weighing and manual testing equipment.

Industrial Ovens' machinery for continuous processing of rubber and plastics is the product of years of creative and practical research in the application of these materials to industry. The new laboratory inaugurates an ambitious, long range program of testing, checking and experiments, to develop coating formulas and techniques for solving problems involving proper selection of materials and processes to effect specific physical properties in finished products.

The end objective of this modern laboratory is to provide the industry with a new means of progress—at management, sales and engineering levels—with respect to production techniques, capacities, raw material availabilities, prices, costs, analyses, modifications of specifications and the development of new end uses for textiles, plastic coated fabrics, nylon strands, cord fabrics, wire extrusions and rubber coatings.

The complete laboratory is available to the rubber and coating industry for pilot runs of an explanatory or research nature. The laboratory is under the supervision of Merle F. Schreurs. Mr. Schreurs, a chemical engineering graduate of Iowa State College, previously was employed as a research chemist at Armstrong Tire & Rubber Co. and the Textileather Corp. at Toledo, Ohio.

Swaggart Joins Jacobs Rubber

John P. Swaggart, formerly associated with the Gates Rubber Co., Denver, Colo., has joined the Jacobs Rubber Division of the Bullard Clark Co., Danielson, Conn., as chief chemist. Mr. Swaggart had been associated with Gates Rubber for the past 25 years as a chemist and development engineer.

Howdy Doody Bendee Foam Doll

Ben-Her Industries Inc., New York, N. Y., has introduced a new latex foam rubber toy, the "Howdy Doody Bendee." Wired for bending, the head, ears, body, arms and legs bend and stay in any desired position. The toy is 17 inches tall and is

decorated with fast colors that are nontoxic and washable. Other than the Howdy Doody Bendee, shown above, the firm also features two other foam latex toys, "Bendee the Rabbit" and "Mickey the Monkey." These are similar in construction to the Howdy Doody Bendee.

Firestone Plans Bond Sale

Firestone Tire & Rubber Co. announced on April 23 that it had registered with the Securities and Exchange Commission an issue of $75,000,000 in 25-year debentures due May 1, 1977. The debentures are intended for public offering through underwriters headed by Harriman Ripley & Co., Inc. The proceeds are to go into general funds for working capital and for plant improvement and expansion. The company financed $160,000,000 of capital improvements for itself and subsidiaries in the six years ended October 31 out of retained earnings and depreciation. The firm has budgeted $35,000,000 for such purposes in the fiscal year ending October 31, 1952. The debentures are to have a sinking fund intended to retire 80% of the issue by maturity.

R.G.A. Elects New Officers

Sir Sydney Palmer was elected chairman and Patrick Boyle Lake Coghlan vice-chairman of the Rubber Growers' Association at the annual meeting of the Association held in London on March 31. Sir Sydney, who spent nearly 40 years in rubber planting in Malaya, is on the board of several London and Malayan companies, and is chairman of the British Rubber Development Board. Mr. Coghlan is a director of Eastern Industries, Ltd., and chairman or director of several other rubber plantation companies. The honorary gold medal of the Association was presented to Sir Eric Macfadyen for services rendered to the rubber plantation industry.

More Certificates of Necessity

The Defense Production Administration has issued a new list of approved Certificates of Necessity for accelerated tax amortization on new or expanded defense facilities. Certificates issued recently include:

Electric Hose & Rubber Co., Wilmington, Del., $366,000 for wire braided hose for aircraft.

B. F. Goodrich Co., Akron, Ohio, $81,920 for wire braided hose for aircraft.

McNeil Machine & Engineering Co., Akron, Ohio, $39,671 for tire and tube presses for military use.

Thermoid Co., Trenton, N. J., $1,132,400 for wire braided hose for aircraft.

U. S. Rubber Co., Naugatuck, Conn., $737,425 for reclaimed rubber.

Narragansett Wire Co., Pawtucket, R. I., $38,020 for wire and cable for the armed services.

Gavitt Manufacturing Co., Inc., Brookfield, Mass., $16,076 for wire and cable.

National Varnished Products Corp., Woodbridge, N. J., $122,370 for Vinylite and Tenite tubing.

Goodyear Tire & Rubber Co., Gadsden, Ala., $8,485,330 for military tires.

Shawinigan Resins Corp., Springfield, Mass., $175,750 for polyvinyl butyral resin.

Addresses Gates Technical Club

The Technical Club of the Gates Rubber Co. of Denver, Colo., at its April meeting held at the Rendezvous in Denver, was addressed by W. E. Chope, president of the Industrial Nucleonics Corp., Columbus, Ohio. Mr. Chope declared that the rubber industry is definitely moving forward in helping to take the "guess work" our of rubber products manufacturing. Mr. Chope's firm recently completed installation and concluded an exhaustive test period of Beta Ray gauges on two calenders at the Gates Rubber plant. He presented recorded evidence of the greater uniformity and better quality of product which the installations were helping to bring about. The speaker supplemented his talk with slides showing types of traces of the gauge, some faults in operation, and how the faults can easily be corrected and controlled.

Office Workers Reject Union

Office workers at the B. F. Goodrich Co. in Akron, Ohio, in a vote on April 30, turned down representation by Goodrich Local 5 of the United Rubber Workers of America, CIO. In an NLRB consent election, the vote was 531 against the union and 497 in favor of representation by Local No. 5. The office workers struck for more than a month recently and with picket lines kept production workers from their jobs and supplies from the plant. The company contended that a certification election should be held, declaring that a majority of the office workers did not care to be represented by Local No. 5. The union did not agree to a consent election until after the strike had been in progress for more than a month. A compromise agreement was reached to end the walkout.

AKRON GROUP HEARS BELCHER; ELECTS OFFICERS FOR 1952-53

The Spring Meeting of the Akron Rubber Group held on April 4 at the Mayflower Hotel in Akron, Ohio, featured an address by Paul E. Belcher, vice-president and cashier of the First National Bank of Akron and an election of officers for the 1952-53 season. The following members were elected to take office on September 1,1952:

Chairman, L. M. Baker (General Tire); *Vice-Chairman*, Roy H. Marston (Binney & Smith); *Secretary*, V. L. Peterson (Goodyear); *Treasurer*, F. W. Gage (Columbia-Southern).

In his talk on "The General Outlook for Rubber," Mr. Belcher stated that the nation faces another round of wage increases which will be followed by still higher prices. He forecast a substantial increase in steel wage levels and higher steel prices, followed by similar increases in the oil, chemical, rubber and other industries. The wage costs, the speaker opined, will be passed on to the consumer in the form of higher prices in another spiral of inflation.

The sales outlook for the rubber industry is good, Mr. Belcher declared, as the companies continue to broaden their base by going into other fields. Neither the tire business nor the general economy faces an early recession, he added. However, business faces the continuing problems of overcoming sales resistance that has developed against rising prices, of checking the ever-climbing cost level, and of keeping profits up in the face of higher taxes.

Following Mr. Belcher's talk, Dr. Sam Selby, head of the Mathematics Department of the University of Akron, gave a demonstration of tricks with numbers.

Philadelphia Group Hears Black

Dr. Sheppard A. Black of the General Laboratories, U. S. Rubber Co., Passaic, N. J., addressed the April 25th meeting of the Philadelphia Rubber Group which was held at the Poor Richard Club in Philadelphia, Penna. Dr. Black spoke on "Unusual Uses of Rubber." In his talk, he said the elastomer family has applications of such wide diversity that picking some as being unusual can be done only at the risk of slighting others of equal interest. Dr. Black's paper touched briefly on a number of applications which make ingenious use of one or more of the characteristics of rubbers, and considered three applications more extensively. Conducting rubber is becoming more important in static dissipation and in heating applications he said. Experiments to evaluate advantages and savings of rubber in roads are well under way. Large pads of rubber serve an important use in the pressforming of sheet metal airplane parts. Examination of all these uses serves to reaffirm the unique position of rubber among engineering materials, he concluded.

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Industrial Ovens Names Allen

John F. Allen

John F. Allen has been named manager of the Allen Extrusion Machinery Division of Industrial Ovens, Inc., Cleveland, Ohio, the company's new plastic and rubber insulation machine subdivision. Mr. Allen has had 30 years of extensive design and engineering sales experience in the rubber and plastics extrusion field. In 1916, he joined his father, Edward E. Allen, as a part-time development and design engineer. When that company merged with the National-Erie Corp. in 1928, John Allen assumed the position of sales engineer of original installations. His association with National-Erie continued up to the time of his appointment at Industrial Ovens.

Chicago Group Hears Reinsmith

The March 21st meeting of the Chicago Rubber Group held at the Morrison Hotel in Chicago, Ill., was addressed by Gerald Reinsmith, chief of the Non-Metallic Structural Materials Unit, Ordnance Corps, Department of the Army. Mr. Reinsmith spoke on "Army Ordnance Mechanical Rubber Goods." His speech covered the organization of the United States services, particularly the various branches which are interested in specifying and evaluating rubber products. The latter part of his talk was illustrated with slides showing particular rubber products, how they were developed, and some open problems which have not as yet been solved. There was also an exhibit of approximately 100 different rubber items used by the Ordnance Corps.

Fire Destroys Yale Rubber Plant

The plant of the Yale Rubber Manufacturing Co. at Sandusky, Mich., was destroyed by fire on April 27 with damage estimated at $1,000,000. The company is presently exploring plans to resume operations in temporary quarters while constructing a new plant. Present plans are to convert an adjoining warehouse to manufacturing while a new plant is built nearby. Under these plans, presses would be set up as soon as obtainable and the plant would begin operation as soon as machinery is installed.

PANEL DISCUSSION AND ELECTION FEATURE FORT WAYNE MEETING

Approximately 175 members and guests of the Fort Wayne Rubber and Plastics Group attended the fourth meeting of the recently-organized group on March 27th at the Hotel Van Orman in Fort Wayne, Ind. The meeting featured an election of officers for the 1952-53 season and a panel discussion on "Processing of Plastics by the Use of Dry Blends." Members elected to office include:

Chairman, Daniel Reahard, Jr. (General Tire); *Vice-Chairman*, Charles Cougill (Auburn Rubber); *Secretary-Treasurer*, Elmer I. Ramga (U. S. Rubber). The following members were elected to serve on the Executive Committee: D. A. Sherman (U. S. Rubber), Charles Butts (Ball Bros.), John Dixon (Anaconda Wire & Cable), Al Laurence (Phillips Chemical), Tom Pollard (Monsanto), and Stanley Choate (O'Connor & Choate).

The panel was composed of J. Carlson (Paranite Wire & Cable), who spoke on dry mixing of plastics in the Speed-Muller; M. W. Williams (Monsanto), who discussed dry mixing of plastics in the ribbon blender; J. L. Foster (Goodrich), who discussed compounding techniques for compounds to be processed as dry blends; H. E. Buecken (National Rubber Machinery), who spoke on the design and operation of plastic extruders. C. D. Jackson (Paranite Wire & Cable) acted as moderator.

Another feature of the meeting was the showing of a film on neoprene by John Ledden (DuPont).

R. I. Group Holds Spring Meeting

The Rhode Island Rubber Club held its Spring Meeting on April 17, at the Metacomet Golf Club, East Providence, Rhode Island. Approximately 25 members of the group enjoyed an informal luncheon, followed by an afternoon of golf. In the evening, 150 members of the club met for dinner and participated in community singing, before the presentation of the general interest subject on "Stereo," presented by representatives of the Worcester Film Corp., Worcester, Mass. The demonstration traced the development of three dimensional photography from its infancy to the present. "Stereo" is of great importance in the teaching of professions and in studying industrial methods. These points were brought to bear, through the use of slides and moving pictures. A social hour was enjoyed after the completion of the demonstration.

Northern Calif. Hears Drogin

Approximately 40 members and guests of the Northern California Rubber Group attended the April 10th meeting held at Angelo's Italian Restaurant in Oakland, Calif. The meeting featured an address by Dr. I. Drogin, director of research for the United Carbon Co. Dr. Drogin spoke on "Methods of Compounding Research." His address was similar to one he presented before the March 11th meeting of the Ontario Rubber Group, C.I.C., a report on which will be found in the April 1952 issue of RUBBER AGE.

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WASHINGTON RUBBER GROUP HEARS TALKS ON HISTORY OF NEOPRENE

The April 16th meeting of the Washington Rubber Group held in the PEPCO Building in Washington, D. C., featured a talk by three speakers from the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc. The subject of the talk was "Neoprene—Its History, Production, and Properties" Dr. M. A. Youker, head of the Elastomers Division, began the talk with a short history of neoprene's origin and the subsequent development of particular types to meet specific requirements.

Dr. Youker discussed the work of Father Nieuwland at Notre Dame University in the 1920's which resulted in the polymerization of acetylene. From these polymers of mono- and di- vinyl acetylene with hydrochloric acid chloroprene was produced. The original trade name of this polymer was Duprene. In 1936 the name was changed to neoprene and also in this year neoprene latices were introduced commercially. Dr. Youker closed his portion of the talk by discussing the first neoprene plants in Deepwater, N. J., and the building of neoprene plants in Louisville, Ky., in 1941.

N. L. Catton of the Mechanical Goods Division continued the talk by discussing the low-temperature characteristics of neoprene. He divided the physical changes into the following categories:

(1) Simple temperature changes. This change occurs rapidly and is completely reversible.

(2) Second-order transition. This transition occurs at —20 to —40° C., taking place rapidly. Hardness and stiffness is characteristic, and these conditions are completely reversible.

(3) Crystallization. Here, 32° F. is the temperature for the most rapid crystallization. The rate of crystallization may be increased by placing the sample under strain.

(4) Plasticizer time effect.

Mr. Catton compared values for the four properties above on samples of neoprene type W, WRT, GN, and GR-S, Butyl and buna. He concluded his discussion by explaining how laboratory tests on rubbers can sometimes be misleading and how the recognition of the need for performance testing is increasing.

A discussion of neoprene's compounding characteristics and products by Dr. R. A. Kurtz of the Sales and Products Development Section, brought the talk to a close. Dr. Kurtz showed a comparison of properties between natural rubber, GR-S, buna-N, Butyl and neoprene. On the basis of the properties compared, neoprene was in the "good" or "exceptional" class for all properties. Some of these properties were low temperature characteristics, compression set, flex life, resilience, oxidation resistance, and heat resistance, the speaker stated.

Dr. Kurtz illustrated his portion of the talk with slides showing practical applications of the neoprene characteristics. An added feature of the meeting was the showing of a film entitled "Neoprene," a production of the DuPont company.

Coming Events in the Rubber Industry

June 5. No. California Rubber Group, Elks Club, Berkeley, Calif.

June 7-8. Los Angeles Rubber Group, Outing, Hotel Del Mar, Del Mar, Calif.

June 7. So. Ohio Rubber Group, Inland Activities Center, Dayton, Ohio.

June 12. New York Rubber Group, Outing, Doerr's Grove, Millburn, N. J.

June 13. Boston Rubber Group, Outing, United Shoe Country Club, Beverly, Mass.

June 13. Ft. Wayne Rubber and Plastics Group, Golf Outing.

June 20. Akron Rubber Group, Outing, Firestone Country Club, Akron, Ohio.

June 20. Boston Rubber Group, Summer Outing, Andover Country Club, Andover, Mass.

June 23-27. A.S.T.M. Fiftieth Anniversary Meeting, Hotels Statler and New Yorker, New York, N. Y.

June 26. Rhode Island Rubber Club, Outing, Metacomet Golf Club, East Providence, R. I.

June 27. Detroit Rubber and Plastics Group, Outing, Forest Lake Country Club, Pontiac, Mich.

June 27. Washington Rubber Group, Summer Outing, Annapolis Roads Club, Annapolis, Md.

July 22. Buffalo Rubber Group, Outing, Transit Valley Country Club, Buffalo, N. Y.

July 25. Chicago Rubber Group, St. Andrews Golf Club, Chicago, Ill.

Aug. 5. New York Rubber Group, Golf Tournament, Baltusrol Golf Club, Springfield, N. J.

Aug. 22 Philadelphia Rubber Group, Summer Outing, Cedarbrook Country Club, Philadelphia, Penna.

Sept. 4. No. California Rubber Group, Elks Club, Berkeley, Calif.

Sept. 8-11. A.S.M.E., Fall Meeting, Chicago, Ill.

Sept. 9. Connecticut Rubber Group, Outing.

Sept. 11. So. Ohio Rubber Group, Engineers Club, Dayton, Ohio.

Sept. 14-19. A.C.S., Annual Meeting, Atlantic City, N. J.

Sept. 25. Ft. Wayne Rubber and Plastics Group, Hotel Van Orman, Ft. Wayne, Ind.

Oct. 3. Detroit Rubber and Plastics Group, Detroit-Leland Hotel, Detroit, Mich.

Oct. 7. Los Angeles Rubber Group, Hotel Mayfair, Los Angeles, Calif.

Oct. 9. No. California Rubber Group, Elks Club, Berkeley, Calif.

Oct. 17. Boston Rubber Group, Hotel Somerset, Boston, Mass.

Oct. 24. New York Rubber Group, Henry Hudson Hotel, New York, N. Y.

Oct. 29-31. Rubber Division, A.C.S., Fall Meeting, Hotel Statler, Buffalo, N. Y.

Nov. 6. No. California Rubber Group, Elks Club, Berkeley, Calif.

Nov. 11. Los Angeles Rubber Group, Hotel Mayfair, Los Angeles, Calif.

Nov. 14. Connecticut Rubber Group, Fall Meeting.

Dec. 4. Ft. Wayne Rubber and Plastics Group, Hotel Van Orman, Ft. Wayne Ind.

Dec. 12. Boston Rubber Group, Hotel Somerset, Boston, Mass.

Dec. 12. Detroit Rubber and Plastics Group, Christmas Party, Detroit-Leland Hotel, Detroit, Mich.

Dec. 12. New York Rubber Group, Xmas Party, Henry Hudson Hotel, New York, N. Y.

Dec. 13. So. Ohio Rubber Group, Miami Valley Golf Club, Dayton, Ohio.

Dec. 16. Buffalo Rubber Group, Xmas Party.

Detroit Holds Panel Discussion

Over 200 members and guests of the Detroit Rubber and Plastics Group attended the April 25th meeting held at the Hotel Detroit Leland in Detroit, Mich. The meeting featured a panel discussion on "Cellular Rubber and Plastics Products." Dr. H. A. Winkelmann (Dryden Rubber) acted as moderator for the discussion. Panel members included: H. V. Beckerleg (Fisher Body), C. S. Yoran (Brown Rubber), E. C. Svendson (U. S. Rubber), C. L. Collins (Bakelite), R. N. Kennedy (Dow Chemical), R. B. Harper (Virginia Rubatex) and G. Sprague (Sponge Rubber Products).

Washington to Hear Rands

The May 21st meeting of the Washington Rubber Group, to be held in the PEPCO Building, Washington, D. C., will feature an address by Dr. R. D. Rands, head agriculturist of the Division of Plant Investigations, U. S. Plant Industry Station, U. S. Department of Agriculture, Beltsville, Md. Dr. Rands will speak on "Production Research on Guayule and Latin American Rubbers." His talk will take the form of an illustrated report.

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NAMES IN THE NEWS

FREDERICK K. LACHER, formerly associated with the Patent Department of the B. F. Goodrich Co., has been named assistant secretary in charge of patent work of the National Rubber Machinery Co., Akron, Ohio.

DR. GODFREY L. CABOT, president and chairman of the board of Godfrey L. Cabot, Inc., has been named honorary president of the Aero Club of New England.

WALTER L. BATEMAN, associated with the B. F. Goodrich Chemical Co. since 1942, has been appointed acting manager of the government-owned synthetic rubber plant at Port Neches, Texas, succeeding J. ERNEST MILLER, who has been named to serve as assistant to the chief of the Synthetic Rubber Division, RFC.

RICHARD M. BLEIER, assistant to the president of the Kleinert Rubber Co. at College Point, Queens, N. Y., has been elected a director of the company.

ROBERT SKROKOV has joined the New York office of the Taylor Instrument Companies in the capacity of industrial sales engineer.

HAROLD A. BRAENDLE and CARL W. SWEITZER of the Columbian Carbon Co. were scheduled to address the Spring Meeting of the Swedish Institution of Rubber Technology which was to have been held on May 1 and 2 in Stockholm.

FREDERICK GARDNER has been named national sales manager of the Plastics Division of the Plymouth Rubber Co., Inc., Canton, Mass. He will maintain sales offices at 267 Fifth Avenue in New York, N. Y.

HAROLD H. BURROWS, formerly manager of the Roll and Tank Departments of Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J., has been appointed sales manager of the Industrial Rubber Goods Sales Division of the company. CHARLES P. MCHUGH has been appointed manager of the Roll Covering and Tank Lining Production Departments of Manhattan Rubber.

HILTON J. TARLOW, formerly associated with the Peerless Printing Ink Co., has been appointed technical director of the Claremont Pigment Dispersion Corp., Brooklyn, N. Y.

LEO HECHT, previously regional sales manager for the Koolfoam Division of the Dayton Rubber Co., has been named national sales manager of the American Foam Rubber Corp., Burlington, N. J.

E. D. YOUMANS, vice-president in charge of manufacturing and research of the Okonite Co., Passaic, N. J., has been elected a director of the company.

ROBERT J. BAUMANN, associated with the Chemical Division of the General Electric Co., since 1949, has been named sales manager of silicone products with headquarters at Waterford, N. Y.

WILLIAM H. STEINKAMP, associated with the Minneapolis-Honeywell Regulator Co. since 1930, has been appointed sales manager of the Industrial Division of the company.

RICHARD W. HACKETT, formerly associated with the Research and Development Group of the Synthetic Rubber Division, RFC, has joined the Delaware Research and Development Corp., New Castle, Del.

RICHARD W. BAUMAN has been appointed sales manager of the Koolfoam Division of the Dayton Rubber Co.

THARON J. ELLIS, formerly factory superintendent at the Rubber Division of the Thermoid Co. at Trenton, N. J., has been named an assistant vice-president of the company.

KAY B. SEBERT, associated with the Goodyear Tire & Rubber Co. since June, 1947, has been named chief chemist of the company plant in Java.

WALTER R. SHEPPARD, formerly sales representative for Stein, Hall & Co., Inc., has retired after more than 40 years of service with the company.

ARTHUR R. LYTLE, associated with the Union Carbide and Carbon Corp. for the past 29 years, has been appointed director of research for the company.

STUART W. HOPKINS has been appointed sales representative in Central New York State for the Chemical Coatings Corp. of Rocky Hill, Conn.

RICHARD W. KIXMILLER, associated with the Celanese Corp. of America since 1946, has been named general manager of the Chemical Division of the company succeeding J. D. FENNEBRESQUE, vice-president, who has been assigned broader duties within the firm.

A. L. FREEDLANDER, president and general manager of the Dayton Rubber Co., will receive the John Pottinger award from the Dayton Chamber of Commerce World Trade Club on May 23 in recognition of his work toward the advancement of goodwill through world trade.

ANDREW G. COLGIN, formerly associated with the Patterson-Ballagh Division of the Byron Jackson Co., has been named sales representative in the East Texas and Mississippi oil fields for the New York Belting and Packing Co.

Schreurs Named Laboratory Head

Merle F. Schreurs

MERLE F. SCHREURS, formerly associated with the Textileather Corp., has been named manager of the new Coating Research and Development Laboratory of Industrial Ovens, Inc., Cleveland, Ohio. With Textileather, Mr. Schreurs was project engineer for the Vinyl Dispersions Division of the company's research and development laboratory. Mr. Schreurs is a graduate of Iowa State College with a degree in chemical engineering. During his career, he was also employed by the Armstrong Tire & Rubber Co. as a research chemist.

M. H. KEEL, associated with the Shell Chemical Corp. since 1948, has been named manager of the newly-formed Advertising Department of the company.

EDWARD SCROBE, associated with the Baird Rubber & Trading Co., and present National A.A.U. champion in gymnastics, is going to Finland as a member of the United States Olympic Gymnastic Team.

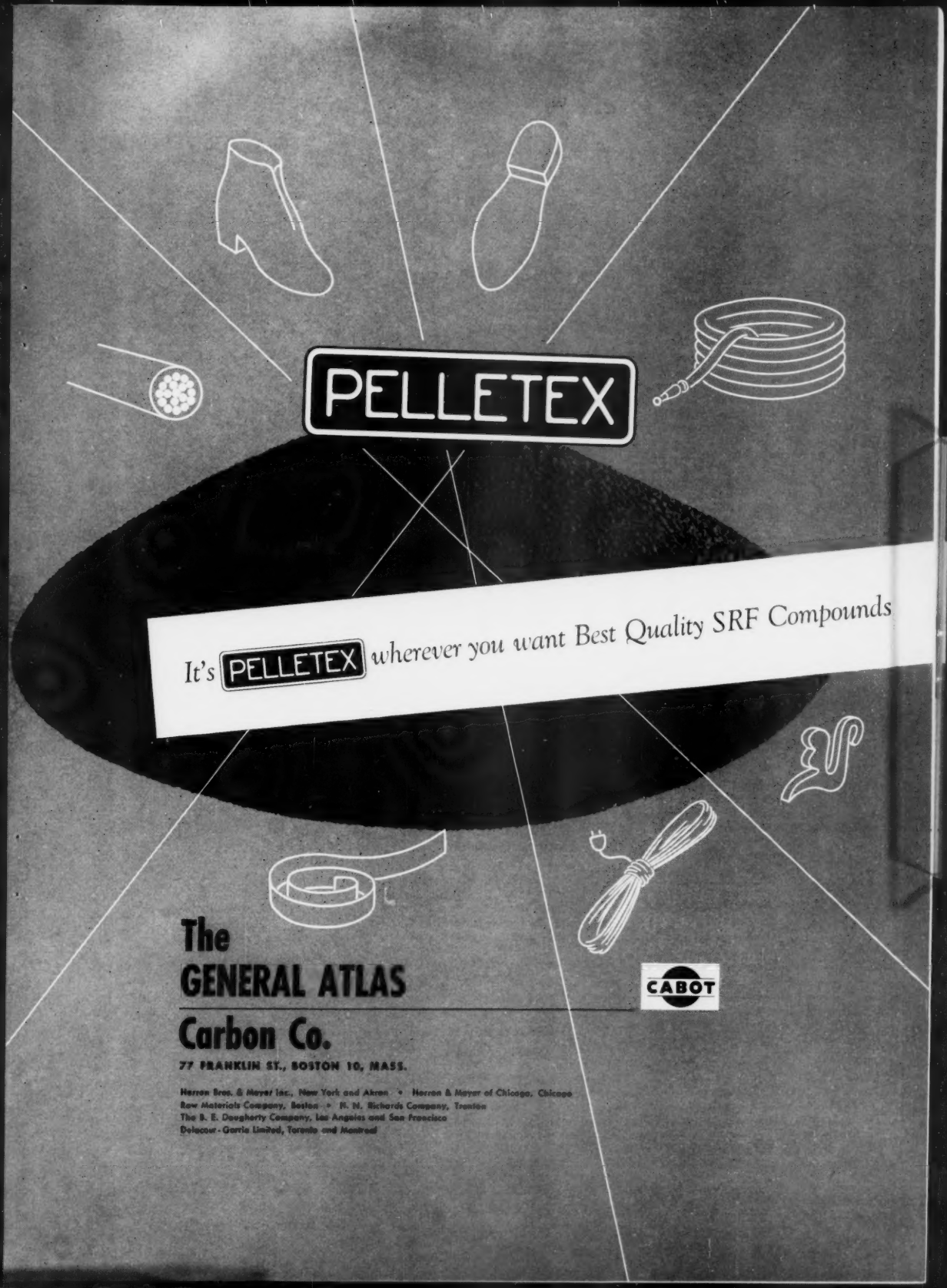
CHARLES H. NAGEL, associated with Hale & Kullgren, Inc., Akron, Ohio, is en route to Israel where he will supervise the installation of machinery at the new Alliance Tire & Rubber Co. plant.

HENRY W. TAVS, formerly merchandise manager of Belding Corticelli, New York, N. Y., has joined the International Latex Corp. in a similar capacity.

CHARLES C. STONE, associated with the Footwear Division of the Tyer Rubber Co., Andover, Mass., throughout his entire business career, has been named sales representative in upper New York State. EMMETT LAMB, for the past 19 years sales representative in New York State, has been named sales supervisor in the state.

L. J. CAMPBELL, formerly vice-president of the Firestone Steel Products Co., has been appointed president of the company.

V. M. BREDIGER, president of the Chardon Rubber Co., has been elected chairman of the board of the company, succeeding the late R. H. BOSTWICK.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The B. E. Dougherty Company, Los Angeles and San Francisco
Delacour-Garris Limited, Toronto and Montreal
CABOT

Named as Guest Lecturers

Five distinguished American and Japanese research scientists will be guest lecturers during a special summer program in the colloid chemistry of Elastic High Polymers in Science and Industry to be held at the Massachusetts Institute of Technology from June 16 to July 5. The guest lecturers are Dr. Herman Mark, director of the Institute of Polymer Research, Polytechnic Institute of Brooklyn, who will talk on "X-Ray Diffractions Studies in High Polymer Chemistry" on June 26; Dr. R. P. Dinsmore, vice-president and director of research for the Goodyear Tire & Rubber Co., who will talk on "Modern Tire Construction" on June 30 and July 1; and Dr. D. S. le Beau, director of research for the Midwest Rubber Reclaiming Co., who will talk on "Reclaiming of Natural and Synthetic Rubber" on July 2 and 3. Dr. Harry L. Fisher, director of the Research and Development Branch of the Synthetic Rubber Division, RFC, will talk on "Synthetic vs. Natural Rubber"; and Dr. Shu Kambara of the Tokyo Institute of Technology, will discuss "Post-War Developments in the Japanese Rubber Industry" at dates to be announced. The special program in elastic high polymers will be conducted by Dr. Ernst A. Hauser, professor of chemical engineering at M.I.T.

DuPont Neoprene Type Q

The Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del., has announced the development of Neoprene Type Q, a special purpose neoprene designed for oil service too rugged for other neoprenes. The new product is a copolymer of chloroprene and acrylonitrile. One of the outstanding characteristics of Neoprene Type Q is its processibility. It has a high plasticity with practically no nerve and, therefore, handles very well on the mill. It also extrudes and calenders in an exemplary fashion, the company states. In addition, it has the type of oil resistance that makes it a good candidate for use in seals against such rough customers as extreme pressure lubricants and refrigerants. Samples and further information are available from the company.

Rubber Study Group to Meet

The International Rubber Study Group was scheduled to meet on May 5 to 9 in Ottawa, Canada, the first time the group has met on the North American continent. The meeting would be the eighth since the group was formed during World War II. Proposals for an international rubber agreement whereby production would be allocated among member nations was discussed at previous meetings. However, the main producers—Indonesia, Malaya and Ceylon—were against such an agreement. Informed sources state that these producers may be more favorable to working out an agreement considering the drop in rubber prices since the Korean conflict. Government and industry use the study group as a method to exchange information on natural and synthetic rubber.

Join Smith Chemical & Color

Eugene Z. Smith has been named to head the Export Department of the Smith Chemical & Color Co., Brooklyn, N. Y., while Howard Greenwald has been appointed head of the company's Special Materials Department. Mr. Smith is a graduate of the University of Illinois. Mr. Greenwald received his training at Johns Hopkins University and at the Wharton School of Finance and Commerce of the University of Pennsylvania. Samuel G. Janon, manager of the company, was recently presented with an inscribed gold wrist watch honoring his completion of 25 years with the company. The New York Paint, Varnish and Lacquer Association at its March meeting presented Mr. Janon with its Paint Pioneer Certificate for 25 years of service to the industry.

Goodyear Names Berry Asphalt

Goodyear Tire & Rubber Co. has granted distribution rights on its pelletized rubbers to the Berry Asphalt Co., of Chicago, Ill. and Magnolia, Ark. Thus, the companies have joined forces to further develop Goodyear's work on rubberized surfaces for playgrounds and other recreational areas. In addition to projecting the rubber playground program, both companies are engaged in the development of synthetic rubber powders for use in asphalt mixes for highway construction. Goodyear's pelletized rubber is being marketed as "Rub-A-Mix."

General Tire Borrows $10,000,000

General Tire & Rubber Co. has borrowed $10,000,000 from a group of insurance companies, according to a recent announcement. William O'Neil, president of the company, said that negotiations were completed on April 3 by Kidder, Peabody & Co. of New York. The money was borrowed, he said, to increase the working capital of the firm in connection with its expanding operations. The loan is for 20 years at 3¾% interest.

Offers Plasticizer Supplies

Dewey and Almy Chemical Co., of Cambridge, Mass., has announced that shipments of both dibutyl phthalate and di-iso-octyl phthalate are available from its Acton, Mass., plant in drums or tank cars. Among other uses, dibutyl phthalate finds application as a plasticizer for nitro-cellulose lacquers, while di-iso-octyl phthalate is used as a plasticizer for polyvinyl chloride compounding.

Ohio-Apex KP-555 Plasticizer

Ohio-Apex, Inc., Nitro, West Va., have announced the development of a new plasticizer, KP-555, which offers outstanding characteristics with N-type synthetic rubbers. The product, bis (dimethyl benzyl) ether, is said to impart excellent tack, good plasticity, and makes for easy extrusion. KP-555 is a low viscosity, relatively high-boiling liquid plasticizer offering impressively short mixing time.

United Wallpaper Color Division

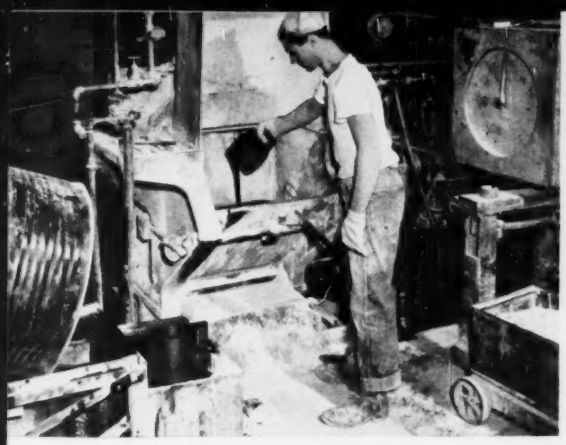
United Wallpaper, Inc., Chicago, Ill., has formed the Color Division for the manufacture of a full line of colors for rubber base or latex type paints, paper coatings and wallpapers. Curt E. Uebel, for 23 years associated with the General Dyestuff Corp., has been named general sales manager of the new division which is already in production at the company's Aurora, Ill., plant. Thomas A. McCormick has been appointed chief chemist of the division. Mr. McCormick was also formerly associated with General Dyestuff Corp. John W. Close, formerly chief chemist for the company, has been named director of technical service for the new division. Production at the Aurora plant at the present time falls into two categories. The first of these is a permanently highly dispersed coloring known as "Auraspers." Produced in already dispersed liquid form, it can be easily mixed with the latex or rubber base materials used in paint for home materials. These pigments are also available in another form, "Aurapulp," which is a heavier paste that is applicable to all industries requiring permanent brilliant pigments in water pulp or pressed cake form. Research in the Color Division is going forward in the development of pigments applicable to the rubber, plastics, and other industries.

Israeli Plant Starts Production

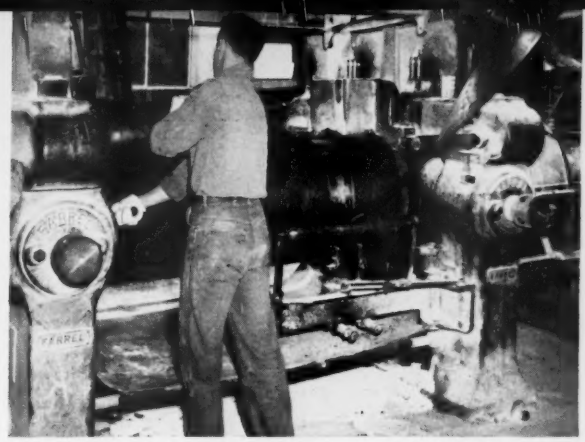
Special ceremonies on April 27 at Hadera, Israel, marked the production of the first tire at the plant of the Alliance Tire and Rubber Co. The plant will actually start commercial operations in September. Half of the company's $3,000,000 capital was put up by Histadrut, the Israeli trade union federation, and half from 600 American investors, including A. L. Freedlander, president of the Dayton Rubber Co. Arthur Taubman of Roanoke, Va., will serve as the first chairman of the board and president of Alliance. In the year beginning in September, the company hopes to make 100,000 to 120,000 tires and tubes. Another plant, owned by the General Tire & Rubber Co., will go into production in the autumn at Petah Tikva, just outside Tel Aviv, and will produce about the same number of tires. Both companies will concentrate on tires for buses and trucks and will export about 60% of their output.

Naugatuck Chemical Appointments

Six organization changes in the Development Department of the Naugatuck Chemical Division, U. S. Rubber Co., were recently announced by M. G. Shepard, general development manager, as follows: Dr. Vadim C. Neklutin, assistant manager of process development; Robert M. Greene, group leader of Paracril and synthetic latex development in the Process Development Section; Robert L. Knap, group leader of Vibrin and Kralac development in the Process Development Section; Dr. William F. Brucksch, Jr., senior group leader for physical chemical research; E. Leonard Borg, senior group leader for applied and developmental research in synthetic rubber; John A. Flickinger, group leader for dispersions and Sealz development.



IDEAL FOR ALL STOCKS. Besides costing less than any of the five process aids it replaced, and its other advantages, Sundex-53 mixes easily with natural, GR-S and reclaim stocks. In the picture above it is shown being added to a batch of heel stock.



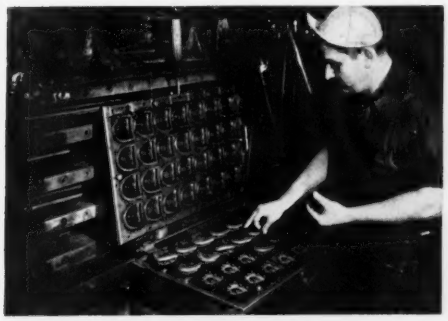
QUICKER, MORE THOROUGH PLASTICIZATION. By using Sundex-53 only, the company has been able to produce a more uniform finished product. Quality heels will be blanked out of the stock leaving this warm-up mill and entering the cutter.

SINGLE GRADE OF SUNDEX REPLACES 5 PROCESS AIDS

Some years ago, as an economy step, the Beebe Rubber Company, Nashua, N.H., tried to reduce the number of process aids it used. Five different types were being employed in the processing of natural, GR-S and reclaim stock for heels, soles and soling slabs.

A Sun representative who had been called in recommended replacing all five process aids with Sundex-53 and the company took his advice. This one "general purpose" rubber-process aid has more than just simplified inventories and purchasing; *it has proved advantageous in other respects besides.* Because of the way it is refined, it works as well with light colored stock as with dark. It quickly breaks down reclaims and does not overprocess natural rubber and GR-S polymers. It costs less than the process aids it replaced, and has eliminated the potential danger of mixing errors.

For more information about Sundex-53 and other Sun Rubber-Process Aids, write to us for the booklet "Processing Natural Rubber and Synthetic Polymers," offered in coupon below.



ECONOMIES ALL ALONG THE LINE. Sundex-53 not only costs less than any of the five products it replaced, but it also saves money through simplification of ordering and stocking. The operator shown above is setting up a mold to vulcanize heels.

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FINANCIAL NEWS

Thermoid Company

For 1951: Net income of $1,742,460, which is equal to $2.02 a share, compared with $1,927,895, or $2.26 a share in 1950. Sales in 1951 rose to a record of $40,272,079, 31% above the $30,779,796 in 1950. Working capital as of December 31, 1951 was $7,382,000, against $6,685,000 at the end of the preceding year.

In the first quarter of 1952, the company reported a net income of $274,316, which is equal to 30c a common share on sales of $9,991,828, contrasted with $450,811, or 52c a share on sales of $9,465,182 in the first quarter of the preceding year.

Anaconda Wire & Cable Co.

For 1951: Net income of $5,765,586, which is equal to $6.83 each on 843,962 capital shares, compared with $5,265,266, or $6.24 each on an equal number of shares in the preceding year. Net sales in 1951 totaled $109,788,919, against $93,687,237 in 1950. Balance sheet items as of December 31, 1951, indicate current assets of $44,740,532 and current liabilities of $20,226,027. At the end of the preceding year, current assets were $34,379,910, while current liabilities were $10,901,458.

U. S. Rubber Reclaiming Co.

For 1951: Net income of $301,719 on sales of $7,645,730, compared with $507,759 on sales of $6,729,501 in 1950.

The company has also reported that for the twelve-week period to March 23, 1952, net income was $48,454, or 39c a preferred share, contrasted with $127,898, or $1 a preferred share, for the twelve weeks ended March 23, 1951.

Dewey & Almy Chemical Co.

First Quarter: Net loss, after a $343,529 tax credit, amounted to $23,529 on net sales of $5,787,961, compared with a net profit of $363,746 on sales of $7,125,801 in the first quarter of the preceding year. The 1951 profit figure has been adjusted to reflect the final 1951 tax rate.

Interchemical Corp.

First Quarter: Net profit of $430,428, which is equal to 52c a common share on net sales of $21,365,649, compared with $919,816, or $1.26 a share on net sales of $24,679,573 in the first quarter of the previous year.

St. Joseph Lead Co.

First Quarter: Net income of $3,575,942, which is equal to $1.45 a share on net sales of $30,864,031, compared with $3,817,246, or $1.55 a share on sales of $29,612,141 in the first quarter of the preceding year.

National Automotive Fibres, Inc.

For 1951: Net income of $3,200,220, which is equal to $3.21 a share on record sales of $86,764,932, compared with $4,779,025, or $4.80 a share on sales of $76,053,409 in 1950.

For the first quarter of 1952, the company has reported a net profit after taxes of $403,926, which is equal to 41c a share, compared with $1,522,140, or $1.23 a share in the first quarter of the preceding year. Sales in the first quarter of this year amounted to $18,803,099, against $24,634,960 in the first quarter of 1951.

Belden Manufacturing Co.

For 1951: Net income of $1,161,570, which is equal to $3.62 a share on net sales of $24,347,503, compared with $1,528,839 or $4.77 a share on sales of $21,915,619 in 1950.

In the first quarter of 1952, the company reported a net profit of $218,486, which is equal to 68c a share, contrasted with $303,840 or 95c a share in the first quarter of 1951.

I. B. Kleinert Rubber Co.

For 1951: Net income, including a special credit of $118,125, representing profit on the sale of investment in the Acushnet Process Co., amounted to $401,100, which is equal to $2.59 a share, compared with $491,053, or $3.11 a share in 1950. Net sales in 1951 totaled $8,414,619, against $8,961,604 in the previous year.

Boston Woven Hose & Rubber Co.

Six Months Ended February 29: Net income of $366,511, which is equal to $4.03 a common share on net sales of $9,559,953, compared with $754,357, or $8.57 a share on sales of $11,154,411 in the comparable period of the preceding fiscal year.

Armstrong Cork Co.

First Quarter: Estimated net profit of $1,943,537, which is equal to $1.21 a common share on net sales of $48,864,165, compared with $2,600,542, or $1.67 a share on sales of $55,125,816 in the first quarter of the previous year.

Allen Industries, Inc.

First Quarter: Net profit of $177,400, or 32c a share on net sales of $6,423,000, compared with $344,484, or 62c a share on net sales of $10,951,483 in the March quarter of 1951.

Mansfield Tire & Rubber Co.

For 1951: Net profit of $2,107,414, on sales of $66,831,583, compared with a 1950 net of $2,585,487 on sales of $47,400,804.

Phillips Petroleum Co.

First Quarter: Net profit of $19,772,140, which is equal to $1.37 a share, compared with $15,882,271, or $1.26 a share in the first quarter of 1950 after adjustment for the 1951 stock split. Gross income in the first quarter of 1952 was $170,523,177, against $141,492,757 in the first quarter of the preceding year. Figures for gross income do not include inter-company business or taxes collected and paid to federal and state governments on sales of gasoline, oil, or other products.

Firestone Tire & Rubber Co.

Quarter Ended January 31: Net income of $9,317,550, which is equal to $2.35 each on 3,903,368 common shares, compared with $10,272,869, or $2.60 each on an equal number of shares in the quarter ended January 31, 1951. Sales in the 1952 quarter totaled $224,064,005, against $211,042,771 in the 1951 quarter. The quarterly statement represents the first ever issued by the company.

U. S. Rubber Co.

First Quarter: Net profit of $6,247,733, or 94c a common share, compared with $9,076,755, or $1.47 a common share in the first quarter of the preceding year. Net sales in the first quarter of 1952 totaled $220,518,963, against $211,930,349 in the first quarter of 1951.

Hewitt-Robins Inc.

First Quarter: Net income of $235,327, which is equal to 82c a common share on net sales of $9,249,589, compared with $282,163, or $1.01 a share, on sales of $8,395,120 for the first three months of 1951.

Converse Rubber Corp.

Year to February 2: Net income of $416,462, or $2.34 a share on 150,000 common shares, compared with $331,794, or $17.78 on 15,000 shares in the previous fiscal year ended January 31, 1951.

American Zinc, Lead & Smelting

First Quarter: Net profit of $951,396, which is equal to $1.29 a common share on sales of $23,014,696, contrasted with $719,628, or 94c a share on sales of $19,621,775 in the first quarter of 1951.

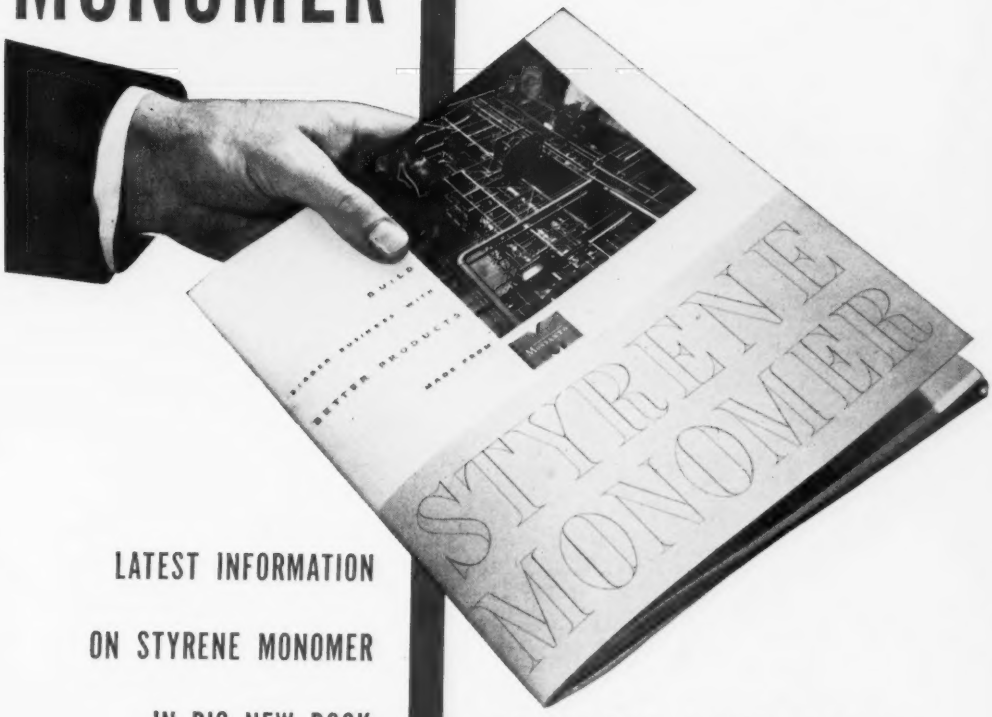
Whitney Blake Co.

For 1951: Net income of $517,078, which is equal to $2.58 a share on net sales of $9,564,860, compared with $410,800, or $2.05 a share on sales of $6,027,377 in the preceding year.

Circle Wire & Cable Corp.

For 1951: Net profit of $2,064,376, which is equal to $2.75 a share on record net sales of $16,603,069, compared with $2,120,680, or $2.82 a share on sales of $15,848,211 in 1950.

STYRENE MONOMER



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Treating styrene monomer as the starting point for large-volume chemical manufacturing, this new book discusses manufacturing and application possibilities of Styrene Butadiene Emulsions, Styrene Polyester Resins, Elastomers, Styrene Modified Alkyd Resins, Styrenated Oils, Ion Exchange Resins, Adhesives and Bonding Agents . . . Under each of these major headings is included a discussion of end products which are being developed in constantly increasing number.

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CANADIAN NEWS

Technical papers on 110 subjects, and the only exhibit of chemicals and chemical process equipment in Canada are among the attractions expected to bring more than 1,000 delegates to Montreal for June 2, 3, 4, to attend the 35th Annual Conference of The Chemical Institute of Canada. The sessions will be held in the Sheraton-Mount Royal Hotel.

Highlighting the first day's activities will be: the presentation of The Chemical Institute of Canada Medal to Professor Otto Maass of McGill University in recognition of his outstanding contributions to Canadian chemistry; an address on "Chemical Industrialization in Canada" by John D. Fennebresque, vice-president of Celanese Corporation of America, New York; a luncheon talk by Hon. Paul Beaulieu, Minister of Trade & Commerce for the Province of Quebec; and the appointment and election of new officers, directors and councillors of the Chemical Institute for the coming year.

In an address before the 37th annual conference of the Industrial Accident Prevention Associations held recently in Toronto, Ont., R. V. Dixon of the Dominion Rubber Co. stated that making safety "everybody's business" has paid off in 2,000,000 accident-free hours of operation at Dominion Rubber's Kitchener, Ont., plant. Safety thinking begins at the top, and a trophy is offered for annual competition among divisions of the company, said Mr. Dixon. Weekly meetings of staff officers are held to discuss accident hazards, new equipment and other safety factors in the plant, he added. To these meetings are brought the thoughts of every workman, who in this way is given an active part in the factory safety program.

The first plant in Canada for the production of hydrogenated fatty acids and glycerides in the inedible field has been completed at New Toronto, Ont., by the W. C. Hardesty Co. at an approximate cost of $100,000. The new hydrogenation equipment includes all the latest improvements, and is designed to be operated completely by one man. The progress of the entire reaction is automatically recorded on a centrally located control panel from which all process variables may be controlled.

Barringham Rubber and Plastics Co., Ltd., Oakville, Ont., has concluded an arrangement with Monsanto Canada, Ltd., for the supply of Ultron vinyl chloride resins. In addition to supplying the resins for Ultron plastics, Monsanto will provide technical assistance for the development of new products in the vinyl field. The arrangement is expected to enable the Barringham Co. to expand and improve its service to consumers.

A 12 to 15% reduction in Canadian tire prices was put into effect in the middle of April, partly because of a Dominion tax cut. Goodyear and Firestone were the first to announce the price cuts. Up until recently, the Canadian government had a 10% sales tax and a 25% excise tax on tires and tubes. A revised federal budget led to reducing the excise tax to 15%. This had the effect of lowering the price of these products by 7½%. The tire firms then added a 5% reduction of their own on passenger tires and 7½% on truck and bus tires, boosting the total reductions from 12½ to 15%.

Polymer Corp. at Sarnia, Ont., ended its allocation system on March 4. With expanded plant facilities, the company now believes that it can fully meet the domestic demand. The company has not as yet decided whether or not it will meet the price reduction on synthetic rubber recently announced in the United States. The present price for GR-S in Canada is 24½c per pound as opposed to 23c per pound in the United States.

In its annual report which showed lower profits, the Seiberling Rubber Co. of Canada explained that the firm had suffered from write-downs during 1951. It was explained that dealer and consumer inventories were abnormal during much of 1951. However, an expected return to a more normal sales pattern, together with an improved dealer structure, should yield greater volume in 1952 than in 1951.

Certificates of Necessity

The Defense Production Administration has made available a recapitulation of all Certificates of Necessity issued and approved through February 25, 1952. The accelerated tax write-off program is provided for in the Revenue Act of 1950 which provides that tax amortization may be shortened to five years for such portion of the new investment as DPA may determine. The recapitulation follows: *Synthetic Rubber*—6 certificates approved involving proposed investments of $16,186,000 of which $10,475,000, or 64.7% was allowed for accelerated tax amortization. *Tire and Inner Tubes*—5 certificates approved on proposed investments of $1,068,000 of which $571,000, or 53.5% was allowed for accelerated amortization. *Reclaimed Rubber* — 9 certificates approved on proposed investments of $6,817,000 of which $4,407,000, or 64.6% was allowed for accelerated amortization. *Insulated Wire and Cable*—24 certificates approved on proposed investments of $8,539,00 of which $3,489,000, or 40.9%, was allowed. *Other Rubber Manufacture*—35 certificates approved on proposed investments of $14,194,000 of which $10,345,000, or 72.9%, was allowed. *Rubber Footwear*—No certificates were approved through February 25, however, 3 certificates involving a proposed investment of $403,000 are pending.

LOS ANGELES NEWS

Approximately 300 members and guests attended the May 0th meeting of the Los Angeles Rubber Group held at the Hotel Mayfair in Los Angeles, Calif. The Kirkhill Rubber Co. sponsored the meeting for the group. This portion of the meeting was addressed by Jose Rodriguez, chief editorial writer for the Los Angeles Examiner. Mr. Rodriguez spoke on the "Education of a Newspaperman".

The technical session of the meeting was addressed by T. Thompson of the Xylos Rubber Co. at Los Angeles. Mr. Thompson spoke on "Regenerated Rubber". The speaker pointed out that within the last 30 years the amount of reclaimed rubber consumed in this country as compared to the total rubberlike hydrocarbon has ranged from a high of 67% in 1942 to a low of 24% in 1930.

Mr. Thompson exhibited slides showing schematic sketches of several methods of reclaiming currently being used in production. These included the wet alkali or caustic process, gun process, Lancaster process and pan-type operation. Additional slides showed characteristics of reclaims as well as performance that can be expected from the various standard types of reclaim in making rubber articles.

Dan E. Budnick has been named vice-president of the Kirkhill Rubber Co., succeeding Howard K. Chamberlain, who has retired after more than 20 years' service with the company. At 29, he is the youngest vice-president in the 33-year history of the company. A native of Cleveland, Ohio, Mr. Budnick served on the sales force of the Thompson Products Co. in that city for four years. He was in the automotive parts business for a year and a half before he joined the Sales Department of Kirkhill Rubber at Los Angeles.

The Los Angeles Rubber Group's first golf tournament of the 1952 season was recently held at the Hacienda Country Club in La Habra Heights, Calif. Thirty-five members and guests enjoyed the good weather and excellent facilities. Prize winners included the following:

Low Gross, Wilbur Johnson; *Low Net*, Gene Huxley; *Best Tee Shot*, Bob Maney; *Longest Putt*, Kenny Courtois; *Longest Drive*, Alex Siamas; *Fewest Putts*, Jack Martin; *Blind Bogey*, Hal Holmes; *High Gross*, Dick White.

Western Insulated Wire Co., makers of "Bronco 60 Certified" neoprene jacketed cord and cable, is now branding full identifying data on the jackets which makes them more convenient to use. To simplify measurement of cut lengths, the name Bronco is placed at two-foot intervals.

Martin & Stockton Co. has been formed at Downey, Calif., for the trimming of molded goods. L. Martin, formerly associated with the S & G Rubber Co. and H. Stockton, previously associated with Kirkhill, Inc., are partners in the new venture.

CABOT'S

Vulcan-6

GODFREY L. CABOT, INC.

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OBITUARIES

C. Laurence Warwick

C. Laurence Warwick, executive secretary of the American Society for Testing Materials, and its administrative head since 1919, died suddenly on April 23, shortly after presiding at a dinner honoring the retiring treasurer of the society. Born on July 29, 1889, Mr. Warwick had been active in the society since 1909 when he graduated from the University of Pennsylvania with a degree in civil engineering. While he was instructor and assistant professor at the University, he also served as assistant secretary of ASTM. In 1919, he was appointed secretary-treasurer, and in 1946 became executive secretary. Mr. Warwick made many notable contributions to the field of standardization and research in materials and was recognized as an outstanding authority on materials. One of his important contributions was in the War Production Board during World War II, where he served as head of the Specifications Branch of the Conservation Division, and later headed the Materials Division. This work resulted in tremendous savings of critical and strategic war materials through the issuance of emergency standards and in other ways. He had written a large number of technical papers and reports dealing with properties and tests of engineering materials and especially standardization of specifications and tests. Funeral services were held on April 26 in Philadelphia, Penna. Mr. Warwick is survived by his wife, two sons and a daughter.

C. Denton Slaughter

C. Denton Slaughter, assistant general sales manager of the Anaconda Wire & Cable Co., died on April 15 at his home in New York City after a brief illness. He was 67 years old. Born in Fullerton, Neb., Mr. Slaughter was graduated from the University of Nebraska in 1907 as an electrical engineer. A few years later he joined the Johns-Manville Corp., as a sales engineer. Later, he was Western representative for various manufacturing concerns. Mr. Slaughter had been associated with Anaconda for more than 33 years, for the last 20 with the home office. He is survived by his wife and daughter.

James E. Carhart

James E. Carhart, assistant manager of the Service Department of the B. F. Goodrich Co. died on April 15. He was 57 years old. Mr. Carhart had been with Goodrich for 33 years and had been assistant service manager since 1947. He was formerly manager of the Tire Conservation Department and had also worked in field testing and mileage contract sales. He had also served as truck and bus tire representative. During World War II, Mr. Carhart organized the company's Army Training School.

T. W. Fazakerley

Thomas Wood Fazakerley, prominently associated with the British rubber industry for many years, and who was planning an extended visit to the United States as reported in our last issue, was killed in an automobile accident at Addington, Surrey, England, on March 28. He was 43 years of age. Entering the rubber industry in 1924, Mr. Fazakerley had been associated with Chas. Macintosh & Co., Ltd., Dunlop Rubber Co., Ltd., Firestone Tyre & Rubber Co., Ltd., and the P. B. Cow group of companies. About two years ago he organized Educational and Scientific Plastics, Ltd., at Croydon, Surrey, of which he was managing director at the time of his death. A frequent contributor to the rubber literature, Mr. Fazakerley was the author of "A Toddler's Guide to the Rubber Industry," which first appeared serially in the *India-Rubber Journal*. A widow and daughter survive.

Herbert T. Beal

Herbert T. Beal, general superintendent of the Denman Rubber Manufacturing Co., Warren, Ohio, died in that city on April 28, 1952. He was 62 years old. Born in Butler, Ind., Mr. Beal's first position in the rubber industry was with the Pennsylvania Rubber Co. Later, he joined the Mansfield Tire & Rubber Co. and the Goodyear Tire & Rubber Co. of Canada. He joined Denman Rubber in 1926 and was named superintendent in 1928. Mr. Beal belonged to many Masonic orders and many trade organizations. He is survived by his wife and son.

Retiring From Binney & Smith

Felix "Fil" Salamon has announced his retirement from the Binney & Smith Co. as of July 1, 1952, after more than 22 years in the Rubber Accessories Department. Mr. Salamon helped found the department and was named its head in 1933. The principal items falling under his jurisdiction included fatty acids, chemical plasticizers, and aqueous dispersions of carbon blacks. His future plans have not as yet been determined. However, he is planning a vacation in Europe during which time he will participate in the British Amateur Golf Championships in Prestwick, Scotland, on May 26.

Pittsburgh Coke Names Vierling

Edward Vierling, Jr. has been appointed sales manager of the Plasticizer Division of the Pittsburgh Coke & Chemical Co., Pittsburgh, Penna. Also announced was the appointment of Walter H. Daub as sales representative for the division. Both Mr. Vierling and Mr. Daub will make their headquarters in the Pittsburgh home office.

DuPont Denies Anti-Trust Charge

A 701-page deposition from Irenee du Pont denying anti-trust charges made by the federal government in its suit against E. I. du Pont de Nemours & Co., Inc., and others was filed in federal court in Chicago, Ill. on April 25. In the deposition, Mr. du Pont traces the steps by which the company acquired interest in the General Motors Corp. and the U. S. Rubber Co. Mr. du Pont said that the company bought into General Motors in 1917 and into U. S. Rubber in 1927. During the questioning for the deposition Mr. du Pont was asked if the purpose of buying into the other companies was so that the products of one could be sold to another. He said that his company did not make the purchases with that purpose in mind, and denied that illegal rebates were given among the three big industries in which the du Ponts have an interest.

General Tire Plans Boston Plant

According to the April 24th issue of the "Boston Daily Globe," Mayor Hynes of Boston, Mass., recently revealed that the General Tire & Rubber Co. is planning to construct three buildings in that city at a total cost of approximately $2,000,000. One building, expected to cost in excess of $1,000,000, will serve as a tire manufacturing plant. The site of this plant has not been disclosed, but the other two structures will be located in the Kenmore Square area and on Old Colony Boulevard in South Boston. The Kenmore Square building will cost about $200,000 and the Old Colony Boulevard structure about $500,000, according to the Mayor. The manufacturing plant will be the first tire fabrication unit in the city. There was no indication from the Mayor as to when construction on these buildings will begin.

U. S. Rubber Buys Milprint Plant

U. S. Rubber Co. has announced the purchase of a plant in Stoughton, Wisc., from Milprint, Inc., of Milwaukee, Wis. The Stoughton plant was built by Milprint in 1947 for the manufacture of plain and printed vinyl films. It has a floor space of 39,000 square feet and employs about 100 persons. Milprint sold the plant in order to concentrate on its large packaging, printing and lithographic business. U. S. Rubber will use the Stoughton plant for the production of new products, principally lightweight, unsupported and supported plastic films.

Latex Conferences in Germany

The International Rubber Office, the German Section of Rubber-Stichting, Delft, Holland, organized six one-day conferences on latex in the cities of Munich, Stuttgart, Frankfurt/Main, Dusseldorf, Hanover and Hamburg during March and April of this year. These conferences were attended by many rubber scientists and technologists all of whom expressed great interest in the new developments in this field. The conferences were sponsored to stimulate interest by the German rubber industry in latex.

HIGHWAY FOR CHEMICALS

WATERWAYS are the oldest highways in the world . . . and just as indispensable as they ever were. Today they keep vital chemicals flowing to you.

Ocean tankers for the shipment of bulk chemicals—pioneered by Shell—and river barges supply Shell marine storage terminals at key industrial centers throughout the country.

Facilities are so co-ordinated that bottlenecks in deliveries are eliminated *before* they happen. Result: Service . . . fast and dependable.

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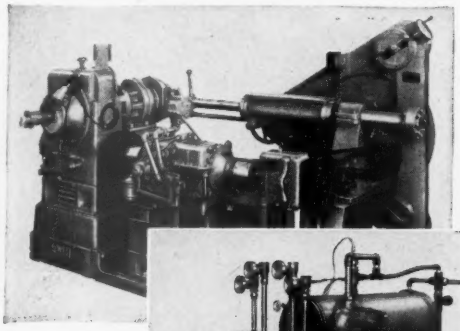
Of Particular Importance

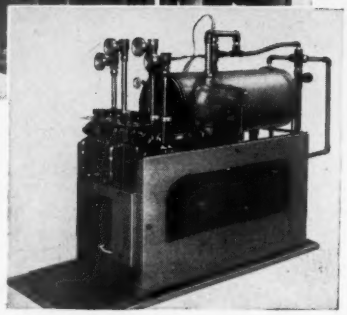
To the Wire Insulating Industry

The room temperature compound process and associated equipment recently developed by the Western Electric Company, Incorporated, offer nine important advantages. These advantages begin with the storage of completely mixed, ready-to-extrude, rubber, GR-S, or Neoprene compounds and extend to a smoother and improved appearance for the finished product.

The complete extruder vulcanizing portion of the room temperature compound process is available to insulated wire producers* from John Royle and Sons who, for seventy-two years, have been building extruding machines to meet the most exacting process requirements.



↑ Royle #2 (3¼") Continuous Vulcanizing Extruder for room temperature compound process.



→ Royle extruder temperature control unit utilizing steam and hot water.

CHECK THESE ADVANTAGES:

- Improved diameter control
- Reduction in compound scrap
- Reduction in electrical faults
- Permits storage of completely mixed compounds
- Permits more economical scheduling of mixing equipment
- Eliminates "warm-up" operation
- Possible mill-room economies
- "Hot" machines may be converted
- Finished product has smoother finish—better appearance

Licensees of Western Electric Company

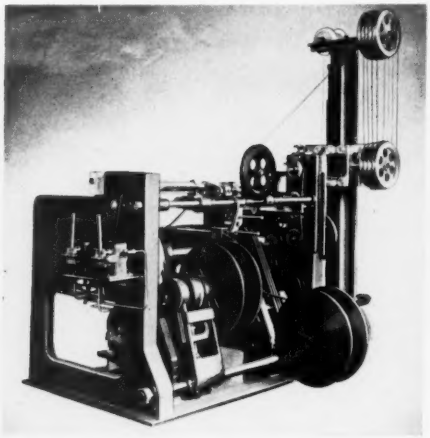
JOHN ROYLE & SONS
10 ESSEX STREET, PATERSON 3, NEW JERSEY

NEW EQUIPMENT

Davis-Standard Wire Take-Up Mechanism

An entirely new take-up unit for electrical wire and cable manufacture has been designed and built by the Standard Machinery Company, Mystic, Connecticut. Called the Davis-Standard Take-Up, the machine has several new features, which are said to overcome many of the difficulties which have plagued the wire industry for many years.

The new take-up has no gears or clutches, and is built to operate smoothly at high production speeds. The



reel drive is by double V-belts, with a brake which automatically stops the reel as it is disengaged. The traverse mechanism is of entirely new design, air-actuated and positive in operation. The reels are shifted in and out of engagement by air pressure and the reel is shifted to floor level to overcome the danger of damage by dropping.

A choice of speed change methods for constant tension control is provided, as well as an efficient dancer control column. The Davis-Standard Take-Up is built in sizes to take reels from 6 to 36 inches, and larger sizes can be furnished on special orders. The construction of the machine is rugged and insures dependable service in 24-hour-a-day operation.

A notable feature of the machine is a lack of noise and vibration, which has always been a disadvantage with old style take-ups. The reel arbor is removable and adaptation can be made for use of coiling heads if desired. Automatic cut-over also is available.

North American Philips Co., Mount Vernon, N. Y., has introduced the **Model EM-100 Electron Microscope,** a new addition to its line. The screen magnification of the new microscope is continuous from 1000X to 60,000X and the instrument is capable of producing micrograms of 30 Angstroms resolution or better. Accelerating potentials of 40, 60, 80 and 100 kilovolts are available.

Circular Chart Controller

An electronically-operated circular chart controller which can control industrial processes according to time-temperature schedules has been developed by the Brown Instruments Division, Minneapolis-Honeywell Regulator Co., Philadelphia 44, Penna. In instances where both time and temperature control are important for product quality and efficiency of operation, the new instrument has an integral-program cam mechanism which automatically positions the instrument control point in accordance with a pre-determined program. The instrument combines, within a single case, measurement and recording on a 12-inch chart, automatic positioning of the set point index as directed by a transparent program cam, and automatic program control of the variable. The combination of these functions in a single instrument has resulted in economy not previously available when it has been necessary to use another instrument or devices separate from the controller. The standard Brown Continuous Balance system is used for measurement. It is available in both electric and pneumatic control. An adjustable micro switch assembly, operated by the cam, is optionally available. The switch assembly is used to de-energize the cam drive motor, shut down equipment, operate signal lights, or perform other electrical functions at the user's option.

New Diaphragm-Operated Valve

A new diaphragm-operated, spring return, single plunger valve for use when only low pressure air is available for the pilot control has been introduced by C. B. Hunt & Son, Inc., Salem, Ohio. The new valve can be operated with instrument air at pressures of from 12 to 35 psi on the diaphragm and consequently is particularly well suited for use in development and research laboratories. The manufacturer claims that improved design prolongs the life of the packing and valve parts and that the valves can be completely disassembled and reassembled in a few minutes without disturbing the main piping.

Easy?
SEE PAGE 150

THESE CLEAN BRIGHT
MAPICO
REDS
ARE STANDOUTS IN MANY USES
297
347
387
IRON OXIDES OF EXCEPTIONAL PURITY

MAPICO REDS always have been noted for high quality and exceptional uniformity. Recent improvements in our plant and equipment make them better than ever. Check over these desirable characteristics:

- Clean bright color and tint
- Easy dispersion and processing
- Color permanence
- Exceptional strength
- Unusual purity
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For better color and better products use these MAPICO REDS in:

- High quality inner tubes
- Footwear
- Rubber hose
- Drug items
- Sundries and
- Chemical goods

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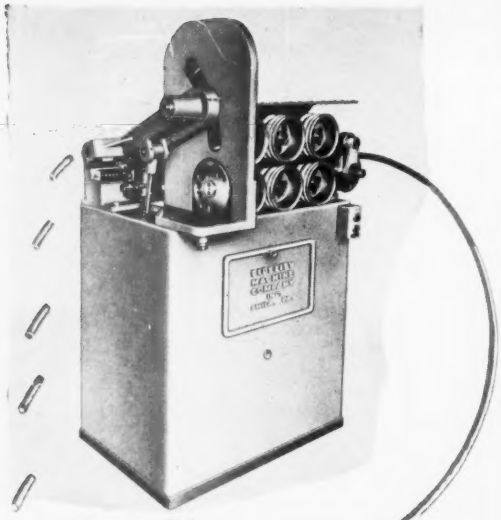


Cut Hose

automatically

at 45 pieces a minute with *NEW*

***Fidelity* Hose**

Measuring and Cutting Machines

Revolutionary in design, the Fidelity Automatic Hose Measuring and Cutting Machine enables you to reduce labor costs, improve quality, boost output, prevent waste, and save floor space.

The Fidelity feeds, measures, counts and *cuts* hose automatically to any present length and holds the closest tolerances. It takes only a moment to change length or diameter. One operator can handle several of these new Cutting Machines. No special skills are required and the operation is 100% *safe*.

Let us send you full details on this new labor-saving development for cutting rubber. Write today for Catalog H.

Manufacturers of intricate precision machinery since 1911.

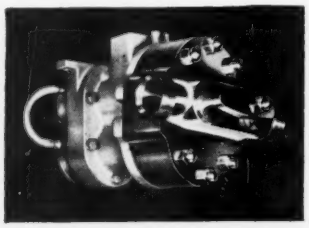
FIDELITY MACHINE COMPANY INC.

3908 Frankford Ave., Philadelphia 24, Pa.

Marco Flow-Master Latex Pumps

The Flow-Master Pumps developed and marketed by the Marco Co., Inc., Third and Church Streets, Wilmington 50, Delaware, on which the company holds basic patents, are positive displacement gear type pumps in which the rotors are hydraulically balanced by the material being pumped. This method of construction guarantees that severe metal-to-metal contact between the rotors and stationary part of the pump chamber is substantially reduced.

Correct tolerances between the rotors and the abutting members are maintained by an exclusive patented control mechanism that automatically compensates for some of



the lateral wear; consequently volumetric efficiency is maintained over a longer period of time. The larger Flow-Master Pumps are equipped with a manually-operated side adjustment which makes it possible to compensate for the wear on the periphery of the pump rotors. Standard tolerance between the periphery of the rotors and the cylinder is .004-inch when the pump is set up. Stuffing boxes are not used in the standard pumps supplied by the company, but instead a single gland sanitary seal is employed, this seal being water cooled.

Flow-Master Commander Model Latex Pumps, such as that illustrated herewith, with capacities up to 725 G.P.H. have been operating successfully in the rubber industry for pumping rubber latices of all kinds, including GR-S and neoprene latices, and many of these are said to operate continuously 24 hours a day for many days before it is necessary to disassemble them for cleaning purposes. Smaller pumps, known as the Model L-100 Series, are also offered by the company, the largest model in this series having a capacity of 108 G.P.H. at 200 r.p.m., while the smallest has a maximum delivery of 13.5 G.P.H. at 200 r.p.m.

All Flow-Master Pumps are precision built, are constructed of stainless metals, and so produced that all parts can be quickly and easily disassembled for cleaning when necessary.

The Marco Co. also produces the Flow-Master Continuous Foam Generator, which continuously produces foam sponge of desired density with uniform cell structure from practically any type of latex.

An entirely new approach to orifice metering is said to be made possible with the **V/A Cell**, a new product recently introduced by the Fischer & Porter Co., Hatboro, Penna. Instead of measuring the static-pressure differential across the orifice, as do conventional mercury manometers, the new unit meters a continuous by-pass stream around that orifice. It is expected to find special application in the manufacture of synthetic rubbers and plastics.

REDUCE PRODUCTION COSTS...

USE HAB-U-CO by HADLEY'S

RESIN EMULSIONS

SUPREME QUALITY...

EXTENDERS...TACKIFIERS

THEY EXTEND AND TACKIFY
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SEND NOW FOR
TECHNICAL DATA
AND SAMPLES

They cut costs as extenders where a high percentage of the rubber content in Latex cements must be reduced.

They lower production costs when used to modify the degree of tackiness in the dry cement film.

All HAB-U-CO Resin Emulsions are light in color thus eliminating any undue staining or discoloration of the cemented surface.

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Mildew-proofing *and* Flame-proofing Cotton Fabrics as per Government Specifications. *Write or Wire for Samples and Quotations.*

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Slash total tape expense

Get up to 60 curings from Martin longer-lasting All-Nylon Tape. Get 7 to 10 times more service than from cotton tape.

Produce a better finish

Get greater natural smoothness faster. Martin All-Nylon Cure Wrapping Tape often eliminates a buffing operation.

Thermoid Company, Trenton, New Jersey, depends on Martin All-Nylon Cure Wrapping Tape

Check these superiorities:

Looped edge • Natural color • Standard widths in stock ($1\frac{3}{4}$", 2", $2\frac{1}{4}$", $2\frac{1}{2}$", $2\frac{3}{4}$", $3\frac{3}{16}$", $3\frac{1}{2}$") • Special widths on request • Put-up, 72 yard rolls, or to order

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All-Nylon Cure Wrapping Tape

Send for sample yardage today

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NEW EQUIPMENT (CONT'D)

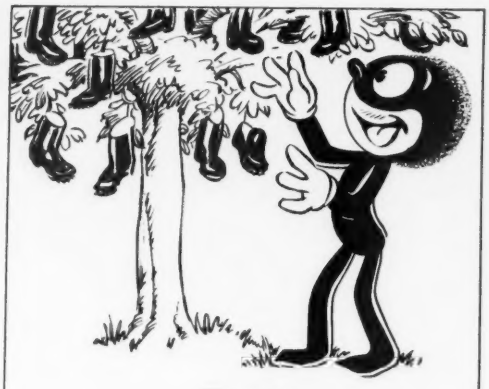
A new **cloth bag collector for dusts** such as carbon black, lamp blacks, pigments, metal oxides, etc., is currently being offered by the Pangborn Corp., Hagerstown, Md. Simplified design of filter bags and mechanism for reclaiming dust from the bags, features of the new collector, are said to provide dust control at low equipment and installation cost.

Minneapolis-Honeywell Regulator Co., Philadelphia 44, Penna., has designed new **Industrial instrument pens** that are said to eliminate flooding and reduce paper plugging and choking. The new pens have removable tips and a new reservoir construction which eliminates flooding because the effective ink level is always below the writing tip.

Especially useful where a temperature detector does not need to be installed permanently, a **new hand pyrometer** with two scale ranges has been announced by the General Electric Meter and Instrument Department, Schenectady, N. Y. The two scale ranges are 0-500° F. and 0-1500° F., and the change from one scale to the other is accomplished by the flick of a switch. Typical applications include temperature checks of plastics molds.

Rotherm Engineering Co., Inc., Chicago 41, Ill., has developed **revolving joints** with stationary or rotating syphons. The joints are capable of handling up to 250 pounds steam pressure and temperatures from −200 to +500 degrees. They are very short in over-all dimensions and are made in sizes from ½ to 5 inches, inclusive. They require no lubrication.

A new ¼-inch, four-way **solenoid-operated spring return air valve** for actuating double-acting cylinders has been announced by Mechanical Air Controls, Royal Oak, Mich. The new valve is compact, measuring 5 inches long, 2½ inches wide, and 2½ inches high. Parts consist of a cast iron base, bronze body and retainers, aluminum spool, and solenoid with aluminum cover. O-rings are used as static seals throughout, and gland type packing is not required.



Easy?

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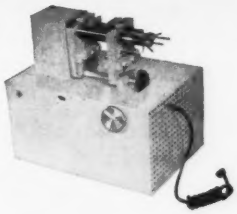

"Completely satisfactory for our purpose . . . satisfies a very definite need for anyone experimenting with small rubber-like parts."
—THE PARKER PEN COMPANY

The New Laboratory Rubber Compound Mill

Handles readily samples of rubber as small as 0.5 grams. For rubber research workers primarily. Enclosed unit designed for utility, adaptability and economy of operation. Easier and faster on original breakdown of very tough samples than ordinary mills. For details write for Bulletin RA-57.

Ivan Sorvall, inc.
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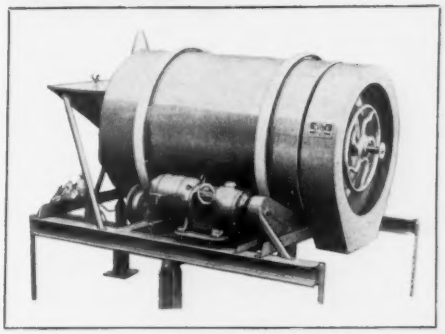
WILLS "SUB-ZERO" ROTARY TUMBLERS



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DEFLASHING RESULTS PROVE STARTLING. MODELS SOON AVAILABLE TO USE EITHER SOLID OR LIQUID CARBON DIOXIDE.

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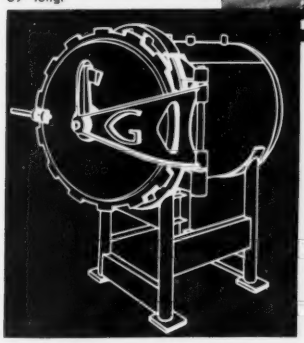
LABOR-SAVING

VULCANIZERS

Illustrated: vulcanizer built by Gussett for the new Marion, Ohio plant of the B. F. Goodrich Company of Akron, Ohio. 42" diameter, 69' long.



GUSSETT DESIGN *SHORT CUTS* NEEDLESS EFFORT... *SAVES* MAN HOURS AND MANPOWER

Investigation of Gussett Vulcanizers can show you how to effect important savings in time and costs, for vulcanizers equipped with the Gussett door require a minimum of attention. The Gussett door is quick-opening — saves time and motion yet is completely hazard-proof. These doors feature bronze bushings at all points of wear, thrust bearings to carry the weight of the door and a fabricated door head. Gussett vulcanizers meet A.S.M.E. Code requirements.

Thirty-eight years of manufacturing experience and know-how are built into every Gussett product. For complete information on vulcanizers, pressure and storage tanks, bins, stacks, etc. Write Gussett today.

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Vulcanized
VEGETABLE OILS

rubber substitutes

Types, grades and blends
for every purpose, wherever
Vulcanized Vegetable Oils
can be used in production
of Rubber Goods—
be they Synthetic, Natural,
or Reclaimed.

A long established and proven product.

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Akron, Boston, Trenton, Chicago, Denver, Los Angeles

REVIEWS

BOOKS

The Engineers' Illustrated Thesaurus. By Herbert Herkimer. Published by Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y. 5½ x 8 in. 572 pp. $6.00.

Over 8,000 illustrations of mechanical movements, machine parts and details are presented in this book, all classified and arranged for easy reference. Every conceivable type of machine element is clearly reproduced and identified, and where necessary an explanation of the method by which it accomplishes its particular function is given. For additional convenience, a comprehensive index is included. Since the purpose of the book is to emphasize underlying principles and not structural details, such as would appear in a textbook of machine design, the sketches and drawings present a maximum of useful basic information without confusing irrelevant detail. Classes of products covered in the book include fasteners, adjusting devices, supports and structures, basic mechanical movements, combustion, prime movers, industrial processes, electrical appliances, and comfort heating, cooling and air conditioning. The book should prove of value to all those concerned with machinery.

•

Chemical Trade Names and Commercial Synonyms. By Williams Haynes. Published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York 3, N. Y. 6 x 9 in. 338 pp. $5.50.

Designed to help the busy chemist, this book is an up-to-date dictionary of more than 20,000 special names used in the chemical industry. A special effort has been made to enable the user to instantly make a distinction between commercial synonyms and trade names. The former are entered with a small first letter; the latter with a capital first letter. Further, each trade name is immediately followed by a key word or initials in parentheses which indicates the firm that controls or uses the particular trade or brand name. In addition, the chemical composition or nature of the substance, as well as its use or uses, is indicated for each trade name listed. A section containing the complete names and addresses of all materials covered is included. The compilation is another valuable tool for all those dealing in any way with industrial chemicals.

•

Communication of Technical Information. By Robert M. Dederich. Published by Chemonomics, Inc., 400 Madison Avenue, New York 17, N. Y. 6 x 8½ in. 116 pp. $5.00.

Written from the point of view of the business manager, this book outlines the fundamental principles governing the communication of technical information. The stress is on the thinking and logic which must underlie communication of such information. The treatment of this subject in this book, therefore, covers not only the written report, but also deals with interorganization memos, progress statements, and the vital subject of oral presentation in conferences. The author views the art of communication as the nerve system of an organization, with the technical man as the integral part, working not only at his specialty, but transmitting his ideas and results to other people.

•

Rubber's Return to the Western Hemisphere. Goodyear Tire & Rubber Co., Akron, Ohio. 6 x 9 in. 24 pp.

Here is a new and informative story on the return of production of natural rubber to the Western Hemisphere, where it first grew and flourished until, at the turn of the century, it was largely transplanted to the Middle East. These facts tell why, for our national security, and for the combined welfare of the sister republics of the Western Hemisphere, a large-scale rubber plantation industry is both economically possible and desirable. The booklet is illustrated with many interesting photographs.

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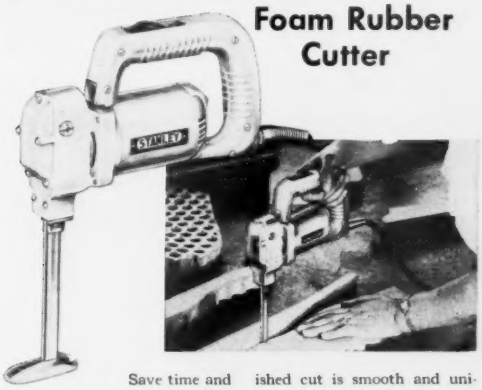

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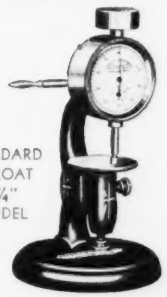

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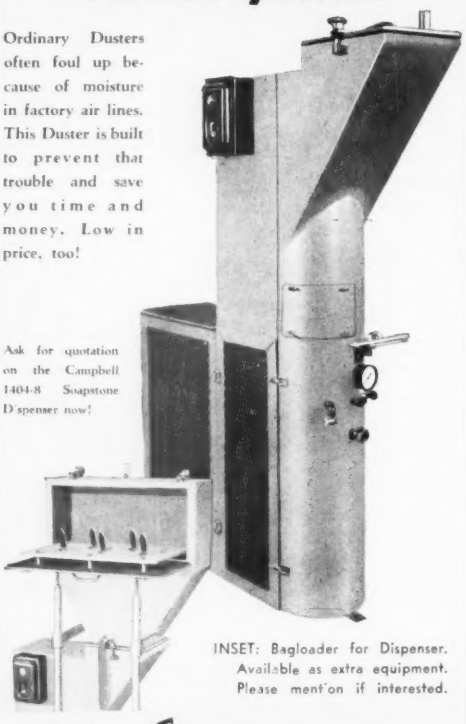

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PEVIEWS (CONT'D)

Handbook of Dangerous Materials. By N. Irving Sax. Published by Reinhold Publishing Corp., 330 West 42nd St., New York 18, N. Y. 7 x 10 in. 848 pp. $15.00.

A digest of the available literature concerning the hazardous properties of over 5,000 materials is presented in this comprehensive handbook. Information is contained of direct value to all those concerned with safely handling, storing or shipping chemicals and other dangerous items. All of the materials, including trade-name products, are alphabetically arranged, cross-referenced, and indexed. Information furnished includes such data as maximum allowable concentration, toxicity, flammability, storage and handling, physical properties, formulas, and shipping regulations. The book is unique in that it discusses not only ordinary chemical hazards, but hazards due to explosives, fungi and fungicides, and radioactivity. It is of further value in that it includes a complete, up-to-date set of I.C.C. shipping regulations. This handbook should prove of inestimable value to every safety engineer, plant superintendent, and all others concerned with the handling and shipping of dangerous materials.

BOOKLETS, CATALOGS, etc.

Organic Chlorine Compounds. (F-4769A). Carbide and Carbon Chemicals Co., 30 East 42nd St., New York 17, N. Y. 8½ x 11 in. 28 pp.

This booklet describes the eleven organic chlorine compounds that are sold in commercial quantities by the company: their uses, physical properties, specifications, and shipping data. Also included in the booklet is a bibliography that lists the important references in the chemical literature to the organic chlorine compounds discussed. An important feature of this new booklet is a section covering the specifications of the organic chlorine compounds as they are shipped. In this section is a complete description of the laboratory test methods that are recommended by the company for determining whether or not the commercial material meets these specifications. The control tests consist of the standard ASTM methods as well as new methods that have been developed in the company's own laboratories.

•

Harflex Plasticizers for Vinyl Plastics. Hardesty Chemical Co., Inc., 41 East 42nd St., New York 17, N. Y. 8½ x 11 in. 20 pp.

The past ten years have witnessed the growth of a new giant among industries in our national economy. In 1941, the production of vinyl chloride plastics approximated 20,000,000 pounds; by 1951, the figure had risen to about 400,000,00 pounds. In addition, there has been the coordinated growth of accessory material industries, including plasticizers, stabilizers, etc. Plasticizers manufactured by the company for use in vinyl chloride polymers are described in this booklet as to fields of application, in general compounding and in typical formulations. The booklet provides complete descriptions as to properties as well as efficiency of the plasticizers.

•

Paracril: Standard Grades, Characteristics and Compounding. (Technical Bulletin No. 1.) Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn. 8½ x 11 in. 28 pp.

The first of a planned series, this bulletin presents a general description of the various Paracrils being produced together with information relating to applicable compounding methods and processing techniques. Information and data on some representative fillers, pigments and plasticizers are also given. Subsequent technical bulletins to be issued will be devoted to detailed studies on specific topics such as fuel and oil resistance, cements, plasticizers, etc.

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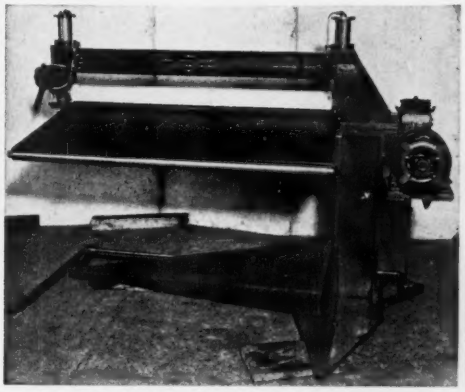

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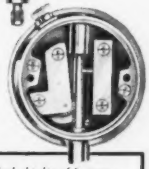

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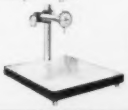

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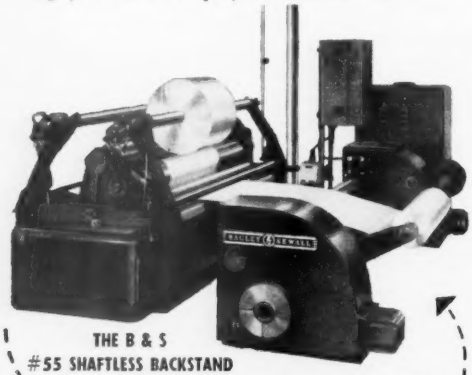
For full details on the Shaftless Backstand and the new B & S Slitters and Rewinders, write to The Bagley & Sewall Company, Watertown, New York.



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REVIEWS (CONT'D)

ABC of Surface Grinding. Norton Co., Worcester 6, Mass. 5 x 7 in. 92 pp.

This manual is directed primarily to operators or prospective operators of surface grinding machines. Present-day precision surface grinders with their "finger-tip" controls and high-speed, velvet-smooth hydraulic table traverse, on the whole, bear little resemblance to their prototypes of 25 years ago. While these engineering refinements have contributed greatly to the ease of operating the machine, it is upon the operator's "know-how," judgment, understanding of grinding wheel behavior, and ability to spot immediately any kind of trouble and correct it that the ultimate productive capacity and earning ability of the machine still depends. Accordingly, this manual seeks to direct the attention of the operator to those details connected with the running of his machine over which he has control.

•

Centralized Instrumentation Unlimited. (Bulletin 85-20.) Brown Instruments Division, Minneapolis-Honeywell Regulator Co., Wayne and Windrim Avenues, Philadelphia 44, Penna. 8¾ x 11 in. 32 pp.

This bulletin describes conventional and graphic type panelboards, as well as the measuring and control instruments utilized. The bulletin covers such subjects as pneumatic transmission, electric transmission, pneumatic receivers, valve position and level indicators, pneumatic controllers, electric controllers, typical control systems, centralized panelboards, panel engineering, and typical engineered panels. This handsome publication is illustrated with photographs and drawings.

•

Cleveland Worm Gear Speed Reducers. (Catalog No. 400). Cleveland Worm & Gear Co., 3271 East 80th Street, Cleveland 4, Ohio. 9 x 11½ in. 180 pp.

This catalog will be found genuinely helpful in selecting worm gearing and worm gear speed reducers. Each model in the complete line of Cleveland worm gear reducers as well as worm and gear sets for built-in power transmission applications is described and illustrated. It contains engineering and application data on each unit, including dimensions, weights and rating tables—all the information needed to determine the correct Cleveland drive for a particular unit. This handsome catalog is bound in handy loose-leaf style.

•

Fundamentals of Instrumentation for the Industries. Brown Instruments Division, Minneapolis-Honeywell Regulator Co., Wayne and Windrim Aves., Philadelphia 44, Penna. 8½ x 11 in. 128 pp.

As indicated by its title, this booklet covers the fundamentals of measurement, control and transmission of variables encountered in industry. Various sections are devoted to such subjects as types of automatic controllers, power units and final control elements, control systems, and panelboards. The final section of the booklet covers typical applications in the processing, paper, steel, textile and other industries. The booklet is profusely illustrated.

•

What's A Silicone? Dow Corning Corp., Midland, Mich. 10½ x 8 in. 36 pp.

On the basis that pictures speak louder than words, this booklet presents a number of pictures, with brief explanations, concerning the experiences of the company's customers with various silicone products. Tabbed for easy references, these applications cover polishes, water repellents, fluids, release agents, lubricants, defoamers, Silastic, protective coatings, and electrical insulation. The booklet is intended to stress the great variety of applications to which the silicone materials have been and can be put.

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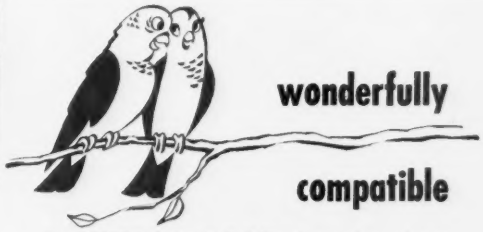

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REVIEWS (CONT'D)

Island Conveying Equipment. Island Equipment Corp., 27-01 Bridge Plaza North, Long Island City 1, New York. 8½ x 11 in. 160 pp.

This catalog contains a series of bulletins, each of which describes some item of equipment produced by the company. The catalog also offers a photographic story of the facilities and personnel of the company. Each of the individual bulletins gives complete specifications, drawings and photographs of installations. Some of the units described include conveying systems, assembly tables, accumulating tables, unscrambling tables and portable belt boosters.

•

Clayton Forced Recirculation Steam Generator. Clayton Manufacturing Co., El Monte, Calif. 8½ x 11 in. 12 pp.

This fully-illustrated booklet describes the automatic, self-contained Clayton steam generator. Details are given on specific industrial applications of the equipment in reducing costs while automatically supplying a dependable volume of steam at constant levels of temperature and pressure. The use of single and multiple installations is described. Operational data, showing the application of the unit to many industrial processes, is given.

•

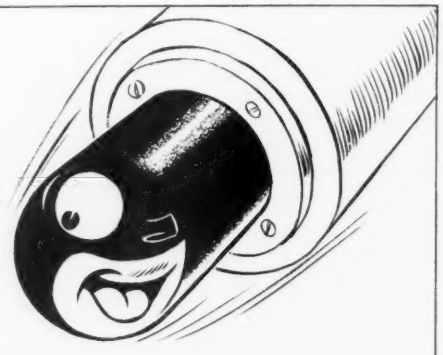
Pie-Flex Portable Mixer and Agitator. (Bulletin 52A.) Manufacturing and Construction Division, Process Industries Engineers, Inc., Pittsburgh, Penna. 8½ x 11 in. 8 pp.

The new Pie-Flex mixer with detached motor which is coupled to the mixer by a flexible drive shaft is described and illustrated in this bulletin. The bulletin contains a table of motor and propeller sizes for different shaft speeds and lists typical applications. The bulletin also describes various types of portable motor mountings while a section is devoted to top and side-entering mixers.

•

Synthetic Waxes. Glyco Products Co., Inc., 26 Court St., Brooklyn 2, N. Y. 8½ x 11 in. 16 pp.

Synthetic waxes of a wide range of physical properties are fully described in this booklet. Tables of specifications are offered for these waxes which include amide and ester types ranging in melting points from 55° C. to 143° C. and in hardness from soft plastic to hard and brittle. Use data are listed for such applications as coatings, lubricants, anti-tack agents, electrical insulants, drawing compounds, flatting agents, release agents, adhesives, etc.



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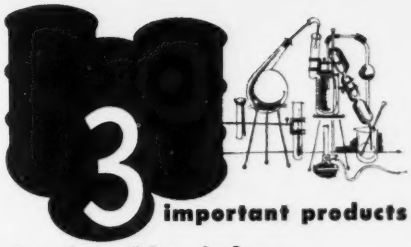

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MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, MAY 5, 1952

Natural Rubber

Rubber traders are awaiting the outcome of the International Rubber Study Group meeting scheduled to begin today (May 5) in Ottawa, Canada. Sentiments expressed at this meeting may, in great part, effect future dealings on the world rubber market. The trade is also awaiting word from Washington on the government's selling price for natural rubber for June. Word is also expected on the government selling policy with regard to rotation rubber.

It has been reported that there is a marked accumulation of uncured slab rubber in Indonesian warehouses coupled with a sharp decline of imports into Singapore. At first, this situation was attributed to exchange difficulties. It later became apparent that Singapore millers are declining to purchase these stocks because they are unable to sell them to the United States. It will be recalled that Malaya has legislative powers to penalize exporters who ship grades below contract specifications.

Labor difficulties at various Indonesian ports have resulted in some loading delays. In some cases, April shipments will not have been fulfilled due to these interruptions. This does not necessarily mean, however, that this rubber will not make June arrival.

Preliminary figures on Malayan rubber exports for April show the lowest total in many months. The estimated figure is 68,555 long tons. This small figure is explained by the restrictions on U. S. purchases in April.

Licenses have been granted in Japan for the purchase of 14,000 tons of natural rubber, including 4,000 tons from Indonesia and 10,000 tons from Malaya.

Quotations for the markets in London and Singapore follow:

London Markets

(Standard Smoked Sheets)

June	34.71 - 35.29
July-September	33.83 - 34.12

Singapore Market

(Standard Smoked Sheets)

June	34.45 - 34.53

Domestic Natural Rubber Prices

Grade	Price (per lb.)
Rilbled Smoked Sheets—No. 1	48¼c
No. 2	47¾
No. 3	47
No. 4	45
No. 5	40½
Thin Latex—No. 1X	56½
No. 1	55½
No. 2	52½
No. 3	49½
Thick Latex—No. 1X	56½
No. 1	55½
No. 2	52½
No. 3	49½
Thin Brown—No. 1X	43½
No. 2X	41
No. 3X	36½
No. 1	38½
No. 2	37½
No. 3	36½
No. 4	34½
Blanket (Amber)—No. 2	38½
No. 3	37½
No. 4	36½
Smoked Blanket—No. 1	38½
No. 2	36½
Flat Bark	30½
Beni Bolivian Para	41½
Liquid Latex	62½

Note: These are General Services Administration Prices (plus service charges) for delivery ex G.S.A. shipping points.

Scrap Rubber

The market for scrap rubber has maintained its low level during this period, a continuation of the condition which has existed for the past several months. In the light of poor sales, most prices quoted were nominal. The lack of dollar exchange has also served to reduce the export business. Prices below have been established by OPS:

(Prices Delivered Akron)

Mixed tires	ton	$26.00
Mixed headless tires	ton	34.00
Light colored carcass	ton	130.00
Black carcass	ton	50.00
No. 1 peelings	ton	65.00
No. 2 peelings	ton	42.00
No. 3 peelings	ton	38.00
Buffings	ton	30.00
Truck and Bus S.A.G.	ton	28.00
Passenger S.A.G.	ton	28.00
Mixed S.A.G.	ton	26.00
Light colored tubes	lb.	.16
Natural rubber red tubes	lb.	.16
Natural rubber black tubes	lb.	.11½
Mixed natural rubber tubes	lb.	.10
Butyl rubber tubes	lb.	.057
GR-S rubber tubes	lb.	.02
Mixed synthetic tubes	lb.	.03

Reclaimed Rubber

There has been a moderate quickening of activity in the reclaimed rubber market in recent weeks. The Department of Commerce estimates reclaim consumption in February at 24,911 long tons, compared with 26,553 long tons in the previous month. Reclaim consumption in the first two months of this year is running about 10,000 tons below the first two months of 1951. OPS-established prices for reclaimed rubber follow:

(Prices for All Areas Except Calif.)

Premium Grade Whole Tire	.10½
First Line Whole Tire	.10
Second Line Whole Tire	.09½
Third Line Whole Tire	.09¼
Fourth Line Whole Tire	.08¾
Black Carcass	.14½
No. 1 Light Colored Carcass	.20¾
No. 1 Select Peel	.11¾
No. 1 Peel	.10½
Butyl Tube Reclaim	.14½
S.P. Natural Rubber Black Tube	.21
Natural Rubber Black Tube	.20
Natural Rubber Red Tube	.24½
Natural Rubber Gray Tube	.24¾

Cotton Tire Fabrics

Levels of activity in the cotton tire fabric market remain fairly nominal with most activity centered about chafer fabrics. The demands of the rearmament program tend, in great part, to shore up an otherwise dull market. Trade sources indicate that these conditions are expected to continue for at least the next few months. Current prices for fabrics and chafers follow:

Standard, Peeler, 12/4/2	lb.	.90
Extra Staple, Peeler, 12/4/2	lb.	.95

Chafers

14.4 oz. (per square yard)	lb.	.86
9.25 oz. (per sq. yard)	lb.	.81½
11.65 oz. (per sq. yard)	lb.	.76
8.9 oz. (per sq. yard)	lb.	.82

Cotton

The price of middling uplands on the New York Cotton Exchange has moved in a range of 3.65c since our last report (April 4), high for the period being 42.80c reached on April 9 and again on April 10, and low being 39.15c reached on April 30. The average price for middling uplands in April was 41.79c based on 21 trading days. This compares with an average of 41.70 in March.

The Department of Agriculture has indicated that, under its price support program on cotton in 1952, it will make direct purchases of the commodity for the first time. Previously, cotton has been supported by producer loans only, but this year the prices will be supported either through government loan or direct purchase.

Cotton will be purchased from the producer at 30.91c a pound, basis middling seven-eighths-inch cotton, or 90% of parity at the beginning of the marketing year (August 1, 1952), whichever is higher. The final loan rate will be announced at the start of the marketing year.

According to the British Board of Trade, Great Britain hopes to buy enough American cotton next year so that it can be sold to British manufacturers at prevailing prices. British users of cotton now pay a higher price based on the average price of all American types of cotton purchased by the Raw Cotton Commission, whether the cotton comes from the United States or not.

OPS has no intention of rolling back raw cotton ceiling prices, according to a recent trade report. The agency has not contemplated such a rollback in the past and would not use one if it suspended raw cotton ceiling prices, an OPS official explained.

Quotations for middling uplands on the Exchange follow:

	Apr. 4	May 5		
	Close	High	Low	Close
May	41.55	38.84	38.41	38.84
July	40.52	38.25	37.70	38.25
Oct.	37.52	36.22	35.95	36.21

Synthetic Rubber

(Dry Types—Per Pound)

Butaprene NF	.465 - .475
Butaprene NL	.475 - .485
Butaprene NAA	.515 - .525
Butaprene NXM	.550 - .560
Chemigum 30N4NS	.400 - .470
Chemigum 50N4NS	.400 - .470
Chemigum N3	.450 - .520
G-E Silicone Rubber (compounded)	3.20 -4.40
G-E Silicone Gum (not compounded)	—— - 5.00
GR-I	—— - .2075
GR-S	—— - .230
Hycar OR-15	.580 - .590
Hycar OR-25	.500 - .510
Hycar OS-10	.550 - .560
Neoprene Types CG and AC	—— - .500
Neoprene Type E	—— - .650
Neoprene Types FR and KNR	—— - .800
Neoprene Type GN	—— - .590
Neoprene Type GN-A	—— - .380
Neoprene Type RT	—— - .400
Neoprene Type S	—— - .380
Neoprene Type W	—— - .400
Paracril B	.500 - .510
Paracril BJ	.500 - .510
Paracril C	.580 - .590
Silastic (compounded)	2.35 -4.40
Thiokol Type A	—— - .470
Thiokol Type FA	—— - .640
Thiokol Type FA	—— - .950
Thiokol PR-1	—— -1.000
Thiokol Type ST	—— -

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STATISTICS *Of Interest to the Rubber Industry*

U. S. Imports and Re-Exports of Natural Rubber

	GROSS IMPORTS										RE-EXPORTS		TOTAL NET IMPORTS
	Natural Rubber (Dry)			Natural Rubber (Latex)			Guayule						
Year	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Long Tons	Total Declared Value	Average Declared Value per pound Cents	Total Gross Imports Long Tons	Long Tons	Total Declared Value	Long Tons
1936	467,064	152,072,496	14.54	19,852	6,659,899	14.98	1,229	286,552	10.41	488,145	12,581	4,488,223	475,564
1937	574,600	237,307,041	18.44	23,185	10,213,670	19.67	2,694	745,873	12.36	600,479	7,902	3,385,433	592,577
1938	397,640	125,373,864	14.08	11,944	4,168,127	15.58	2,508	628,886	11.19	412,092	5,652	1,799,124	406,440
1939	469,946	167,586,780	15.92	27,437*	10,467,552	17.03	2,233	463,345	9.27	499,616	13,125	5,832,618	486,491
1940	781,202	303,308,823	17.33	33,789	14,593,466	19.28	3,633*	758,007	9.31	818,624	7,060	3,197,136	811,564
1941	989,498	401,976,317	18.14	34,797*	15,965,627	20.48	4,881	1,145,767	10.48	1,029,176	5,376	2,757,872	1,023,800
1942	266,276	112,537,426	18.87	10,646	5,630,667	23.61	5,523	1,660,792	13.42	282,445	10,856	5,913,386	271,589
1943	50,358	31,369,198	27.81	1,890	1,312,202	31.00	7,678*	3,636,789	21.14	59,926	22,583	16,446,707	37,343
1944	103,847	73,908,549	31.77	3,091	2,092,211	30.99	6,701*	3,351,233	22.33	113,639	9,739	8,712,695	103,900
1945	134,408	95,814,102	31.82	4,733	3,115,853	30.22	10,040	5,963,797	26.52	149,221	9,509	7,201,746	139,712
1946	366,415	222,552,939	27.12	8,421	5,843,085	29.14	5,344	2,859,246	21.89	380,180	7,711	5,331,954	372,469
1947	691,087	306,951,814	19.83	17,542	9,787,722	30.98	2,884	1,492,825	23.11	711,513	4,121	2,354,494	707,392
1948	702,293	290,849,177	18.49	32,745	9,820,080	24.93	302	71,330	10.53	735,340	6,672	3,259,324	728,668
1949	630,818	225,341,459	15.95	29,974	14,970,478	22.30	....	.....	....	660,792	6,253	2,746,109	654,539
1950	751,966	418,794,962	24.85	51,627	39,717,410	34.34	740	254,331	14.54	803,593	8,640	6,832,821	794,953
1950:													
Oct.	73,205	53,151,003	32.41	5,161	5,485,816	47.46	10	7,496	33.18	78,376	564	500,623	77,812
Nov.	68,462	62,121,636	40.51	4,456	6,227,022	56.71	29	21,618	33.46	72,947	604	724,050	72,343
Dec.	65,282	66,092,508	45.11	3,954	5,191,321	58.62	25	24,864	44.40	69,236	1,400	1,757,047	67,836
1951:													
Jan.	84,864	90,707,863	47.72	7,502	10,283,208	61.18	88	84,977	43.01	93,366	819	1,150,246	92,547
Feb.	49,217	55,013,580	49.90	5,347	8,314,086	64.91	123	119,086	43.27	54,687	552	790,345	54,135
Mar.	55,574	63,104,361	56.92	7,379	11,140,554	67.40	100	100,048	44.61	62,553	322	449,703	62,231
Apr.	48,931	55,238,582	50.31	5,850	9,604,002	73.29	182	183,311	44.93	54,963	3	3,942	54,960
May	37,717	44,187,969	52.27	4,534	7,584,613	74.67	99	80,285	36.16	42,370	7	11,132	42,363
June	51,811	61,809,219	53.26	4,692	7,475,970	71.13	120	84,110	30.14	56,623	224	423,689	56,399
July	67,511	78,807,699	52.11	5,619	8,522,995	67.71	154	99,482	28.82	73,284	....	....	73,284
Aug.	66,217	70,536,735	47.55	4,529	5,805,789	57.23	148	93,807	28.31	70,894	159	290,479	70,735
Sept.	59,309	57,619,906	43.44	1,800	1,838,512	45.59	121	78,427	29.00	61,230	89	45,061	61,141
Oct.	51,850	49,109,610	42.28	3,055	3,499,763	51.15	206	149,590	32.42	55,111	73	120,779	55,038
Nov.	54,561	51,161,914	41.79	2,620	3,251,833	55.42	107	75,370	32.19	57,278	67	96,521	57,211
Dec.	44,332	42,695,894	42.99	860	1,190,609	61.82	171	110,448	28.79	45,363	25	22,732	45,338

Source: U. S. Department of Commerce. * Adjusted to agree with total gross imports.

Notes: (1) Figures for latex are on a dry weight basis. (2) Figures for re-exports include natural rubber (dry and latex) and guayule. (3) In the years 1940 through 1943, crepe sole rubber imports were reported under a separate classification. Such imports, which are included under natural rubber, dry above, were: 856,294 pounds, valued at $191,097 in 1940; 379,607 pounds, valued at $85,924 in 1941; 662,503 pounds, valued at $159,530 in 1942; and 21,653 pounds, valued at $5,215 in 1943.

Natural Rubber
(Including Latex and Guayule)

(All Quantities in Long Tons)

Year	New Supply	Consumption	Re-Exports	Stocks On Hand at End of Period
1936	488,145	575,000	12,581	223,000
1937	600,479	543,600	7,902	262,204
1938	411,983	437,031	5,652	231,500
1939	499,473	592,000	13,125	125,800
1940	818,243	648,500	7,060	288,864
1941	1,029,007	775,000	5,376	533,344
1942	282,653	376,791	10,856	422,714
1943	55,329	317,634	20,815	139,594
1944	107,834	144,113	9,665	93,650
1945	135,672	105,429	6,743	118,715
1946	400,647	277,597	4,338	237,467
1947	688,354	562,661	4,101	129,038
1948	735,227	627,332	6,673	141,541
1949	660,792	574,522	6,253	106,619
1950	804,143	720,268	8,644	91,434
1951	732,925	454,015	2,603	76,569
1950:				
Dec.	67,895	44,999	1,400	91,434
1951:				
Jan.	92,454	44,586	819	93,079
Feb.	54,564	37,572	552	87,242
Mar.	62,904	35,335	332	76,312
Apr.	54,781	39,508	185	71,679
May	42,271	42,445	151	68,498
June	56,504	39,998	224	68,369
July	73,180	35,478	...	67,816
Aug.	77,338	36,506	158	67,491
Sept.	61,409	36,887	27	56,941
Oct.	55,219	37,407	73	63,501
Nov.	57,168	35,037	67	63,689
Dec.	45,193	33,230	25	76,369
1952:				
Jan.	83,130	36,934	140	82,356

Source: U. S. Department of Commerce.

U.S. Gross Imports of Balata, Jelutong, Gutta-Percha, etc.

(All Quantities in Long Tons)

	Balata		Jelutong		Gutta-Percha & Other Guttas	
Year	Tons	Value	Tons	Value	Tons	Value
1936	535	199,368	6,163	1,296,364	1,568	555,643
1937	354	151,344	7,109	2,017,786	1,122	440,894
1938	509	181,140	9,132	2,944,504	444	204,582
1939	694	265,553	6,640	1,603,418	1,740	539,255
1940	648	300,500	7,451	2,449,137	2,340	1,004,885
1941	924	489,514	8,821	2,954,001	1,783	607,025
1942	1,544	1,107,059	1,200	530,296	804	525,763
1943	1,047	708,701	35	14,840	....	.....
1944	1,012	660,805	88	45,578	10	4,999
1945	1,361	907,253	....	.....	36	21,970
1946	2,281	2,233,065	304	256,169	423	458,064
1947	1,982	2,276,531	2,878	1,496,887	392	779,591
1948	1,195	805,078	3,401	2,377,765	423	542,788
1949	1,391	814,554	1,043	834,978	197	189,021
1950	2,117	1,589,885	1,789	1,515,162	541	745,418
1950:						
Aug.	171	102,985	234	200,912	46	41,790
Sept.	119	102,475	175	146,493	37	59,004
Oct.	372	311,959	174	132,632	64	146,707
Nov.	735	588,135	214	183,907	51	102,599
Dec.	124	126,709	82	91,411	28	16,361
1951:						
Jan.	242	200,534	184	227,244	108	118,988
Feb.	86	76,034	128	214,303	12	11,014
Mar.	30	22,838	192	222,934	33	65,143
Apr.	364	241,725	86	180,518	43	39,402
May	306	200,459	130	194,904	26	22,515
June	227	153,222	151	250,828	72	63,998
July	115	94,073	193	308,222	23	32,106
Aug.	121	136,723	142	224,194	8	7,060
Sept.	392	227,392	62	105,395	12	14,660
Oct.	368	383,056	138	241,246	5	6,175
Nov.	148	123,442	167	270,243	33	26,011
Dec.	96	113,773	52	99,761	8	23,467

Source: U. S. Department of Commerce.

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Synthetic Rubber—Totals

(GR-S, Neoprene, Butyl, and Buna N Types)

(All Quantities in Long Tons)

Year	Production	Imports	Consumption	Exports	Stocks On Hand at End of Period
1941	8,383	.....	6,259	572	1,702
1942	22,434	.....	17,651	1,419	4,612
1943	231,722	.....	170,891	18,148	41,568
1944	762,630	11,043	566,670	104,266	142,927
1945	820,373	10,407	693,580	83,778	203,454
1946	740,026	7,709	761,699*	72,920	114,963
1947	508,702	1,093	559,566	11,385	62,366
1948	488,343	15,671	442,072	4,874	115,111
1949	393,690	17,242	414,381	6,483	98,042
1950	476,184	25,722	538,289	7,652	52,758
1951	845,155	10,085	758,897	9,249	129,420
1951:					
Oct.	79,285	777	68,923	541	109,407
Nov.	73,045	714	61,419	1,162	116,910
Dec.	76,958	897	60,421	1,419	129,420
1952:					
Jan.	75,214	1,280	69,430	1,803	137,785
Feb.	73,807	1,062	65,372	2,565	114,995

Source: U. S. Department of Commerce.

Notes: (1) These figures are revised from time to time and the latest available issue should be consulted for the most accurate data. (2) Figures shown include the output of both government and privately-owned plants. (3) Figures for 1941 are estimated. * Includes year-end adjustment of 5,384 tons to cover non-reporting companies.

Synthetic Rubber—By Type

(All Quantities in Long Tons)

New Supply

	GR-S (Buna S)	GR-M (Neoprene)	GR-I (Butyl)	Buna N Types	Total
1944	679,949	56,660	20,252	16,812	773,673
1945	724,859	45,672	52,378	7,871	830,780
1946	613,408	47,766	80,823	5,738	747,735
1947	408,858	31,493	62,824	6,618	509,795
1948	405,492	34,848	56,662	7,012	504,014
1949	310,599	35,215	54,046	11,072	410,932
1950	378,887	50,067	60,915	12,037	501,906
1951	704,525	58,907	76,475	15,333	855,240

Consumption

1944	495,552	46,243	10,763	14,112	566,670
1945	600,145	42,394	43,012	8,029	693,580
1946	632,126	44,357	79,228	5,988	761,699
1947	448,589	37,703	68,838	4,536	559,666
1948	345,313	32,118	58,870	5,771	442,072
1949	299,420	31,753	50,855	8,827	414,381
1950	416,230	43,781	66,348	11,930	538,289
1951	626,444	48,887	70,500	13,066	758,897

Exports

1944	98,380	4,799	530	557	104,266
1945	76,555	5,837	980	406	83,778
1946	68,763	2,643	495	797	72,697
1947	7,951	2,617	62	755	11,385
1948	1,093	2,875	21	885	4,874
1949	1,401	3,330	178	1,574	6,483
1950	900	4,826	31	1,895	7,652
1951	483	6,825	216	1,725	9,249

Stocks at End of Period

1944	116,130	11,739	9,892	5,166	142,927
1945	170,571	9,703	18,378	4,802	203,454
1946	81,483	10,470	19,478	3,755	115,186
1947	40,606	5,237	13,184	3,339	62,366
1948	96,282	5,072	10,995	2,762	115,111
1949	77,731	4,654	12,224	3,433	98,042
1950	36,942	5,733	7,243	2,840	52,758
1951	105,271	8,379	12,481	3,289	129,420

Source: U. S. Department of Commerce.

Notes: (1) These figures are revised from time to time and the latest available issue should be consulted for the most accurate data. (2) Figures for GR-M and Buna N Types include production of privately-owned plants.

Gasoline Consumption

(In Thousands of Barrels of 42 Gallons)

	1945	1946	1947	1948	1949	1950	1951	1952
Jan.	52,008	51,746	57,057	61,308	63,125	66,981	80,554	86,863
Feb.	48,856	47,654	50,551	56,487	57,980	63,274	72,717	82,043
Mar.	55,364	56,703	59,947	68,171	73,282	78,780	86,486	.....
Apr.	59,024	62,111	64,140	72,183	75,318	80,350	87,430	.....
May	60,748	66,800	70,865	77,186	81,665	89,035	100,388	.....
June	60,580	63,247	71,329	78,044	83,374	90,174	96,093	.....
July	66,170	60,076	73,441	83,428	82,129	91,677	100,476	.....
Aug.	70,058	66,729	72,089	80,351	84,707	94,507	101,206	.....
Sept.	64,529	62,268	71,384	76,159	80,832	86,735	91,803	.....
Oct.	55,708	66,637	73,277	75,164	79,327	89,067	99,945	.....
Nov.	53,543	61,345	64,158	72,560	76,346	82,688	88,702	.....
Dec.	49,745	61,101	67,506	72,162	75,628	81,032	84,394	.....
Total	696,333	735,417	795,015	871,270	913,713	994,290	1,090,354	.....

Source: U. S. Bureau of Mines.

Reclaimed Rubber

(Including Natural and Synthetic)

(All Quantities in Long Tons)

Year	Production	Consumption Tons	Consumption % to Crude [a]	Exports	Stocks On Hand at End of Period
1936	150,571	141,486	24.6	7,085	19,000
1937	185,033	162,000	29.8	13,233	28,800
1938	122,400	120,800	27.6	7,403	23,000
1939	186,000	170,000	28.7	12,611	25,250
1940	208,971	190,244	29.3	11,347	32,636
1941	274,202	251,231	32.2	13,851	41,750
1942	286,007 [b]	254,820	64.6	30,405	42,532
1943	304,058 [c]	291,082	59.6	15,678	46,201
1944	260,631 [d]	251,083	35.3	11,800	43,832
1945	243,309	241,036	30.2	13,413	28,155
1946	295,612	275,410	26.5	14,461	33,666
1947	291,395	288,395	24.8	14,556	35,943
1948	266,861	261,113	24.4	11,428	32,630
1949	224,029	226,679	22.5	10,637	28,263
1950	314,008	303,733	24.1	11,740	35,708
1951	366,700	346,121	28.5	14,722	45,082
1951:					
Aug.	29,175	28,598	27.5	991	43,900
Sept.	26,927	26,226	24.9	970	43,095
Oct.	29,636	27,744	26.1	970	44,367
Nov.	25,513	24,509	24.4	984	44,049
Dec.	23,692	22,044	24.8	1,024	45,082
1952:					
Jan.	27,855	26,553	24.9	958	45,067
Feb.	24,078	24,911	24.8	991	43,966

Source: U. S. Department of Commerce.

Notes: (1) These figures are revised from time to time and the latest available issue should be consulted for the most accurate data. (a) Includes natural and synthetic rubber. (b) Includes 893 tons of imports. (c) Includes 67 tons of imports. (d) Includes 21 tons of imports.

Automobile Production in U. S.

(Civilian Production Only)

Year	Passenger Cars	Trucks	Total	Year	Passenger Cars	Trucks	Total
1932	1,135,491	235,187	1,370,678	1942	220,814	133,083	353,897
1933	1,573,512	346,545	1,920,057	1943	0	4,501	4,501
1934	2,177,919	575,192	2,753,111	1944	0	124,819	124,819
1935	3,252,244	694,690	3,946,934	1945	83,792	313,643	397,435
1936	3,669,528	781,862	4,451,390	1946	2,148,699	930,760	3,079,459
1937	3,915,889	892,382	4,808,271	1947	3,558,178	1,220,634	4,778,812
1938	2,000,985	485,852	2,486,837	1948	3,909,270	1,363,856	5,273,126
1939	2,866,796	704,308	3,571,104	1949	5,108,841	1,123,736	6,232,577
1940	3,692,328	721,637	4,413,965	1950	6,665,836	1,332,263	7,998,099
1941	3,744,500	875,381	4,619,681	1951	5,337,729	1,420,432	6,758,161
1951:							
Jan.	478,589	127,583	606,172	July	381,407	110,244	481,651
Feb.	505,865	111,935	617,800	Aug.	426,932	121,993	548,925
Mar.	617,399	136,794	754,193	Sept.	365,906	109,353	475,259
Apr.	503,038	135,415	638,453	Oct.	414,533	110,740	525,273
May	511,938	140,047	651,985	Nov.	356,788	93,179	449,967
June	482,029	134,818	616,847	Dec.	293,305	17,481	310,786
1952:							
Jan.	273,572	101,060	374,632	July	.....	.....	.....
Feb.	333,885	100,706	434,591	Aug.	.....	.....	.....
Mar.	373,231	109,173	482,404	Sept.	.....	.....	.....
Apr.	.....	.....	.....	Oct.	.....	.....	.....
May	.....	.....	.....	Nov.	.....	.....	.....
June	.....	.....	.....	Dec.	.....	.....	.....

Source: Automobile Manufacturers Association.

Note: Figures are based on factory sales. Revisions are made from time to time in these figures and the latest issue should be consulted for accuracy.

Rim Production

	1947	1948	1949	1950	1951
Passenger Car	21,346,004	23,842,796	27,715,344	35,096,404	29,146,048
Truck & Bus	7,737,353	6,920,231	4,238,174	6,625,129	6,877,419
Agricultural	2,633,699	3,140,882	2,695,430	2,853,483	3,019,581
Earth Mover	10,610	13,330	9,895	15,602	28,026
Total	31,727,666	33,917,239	34,658,843	44,590,618	39,071,074

	1951 Oct.	Nov.	Dec.	1952 Jan.	Feb.	Mar.
Passenger Car	2,532,605	2,014,709	1,486,987	1,919,500	1,851,197	1,967,057
Truck & Bus	609,375	501,016	564,243	605,079	453,336	573,344
Agricultural	272,152	181,560	224,498	227,999	232,666	224,208
Earth Mover	1,529	2,227	3,851	5,077	4,121	7,468
Total	3,415,661	2,699,512	2,279,579	2,757,655	2,541,320	2,772,077

Source: The Tire & Rim Association, Inc.

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Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1939 (total)	18,208	38,022	1,279	57,509	57,613	8,665
Passenger Car.	15,742	33,471	607	49,820	49,933	7,108
Truck and Bus	2,466	4,551	672	7,689	7,680	1,557
1940 (total)	22,252	35,346	1,176	58,774	59,186	9,127
Passenger Car	19,560	30,903	411	50,874	50,965	7,270
Truck and Bus	2,692	4,443	765	7,900	8,221	1,857
1941 (total)	24,780	39,895	1,489	66,164	61,540	4,436
Passenger Car.	19,855	34,119	586	54,560	50,392	3,165
Truck and Bus	4,925	5,776	903	11,604	11,148	1,271
1942 (total)	6,680	8,872	207	15,759	15,351	6,247
Passenger Car.	910	2,734	38	3,682	2,790	4,432
Truck and Bus	5,770	6,138	169	12,077	12,561	1,815
1943 (total)	6,128	18,547	225	24,900	20,423	1,883
Passenger Car.	82	10,606	71	10,759	7,620	1,132
Truck and Bus	6,046	7,941	154	14,141	12,803	751
1944 (total)	6,654	26,439	263	33,356	33,446	2,013
Passenger Car.	208	18,330	130	18,668	18,819	1,218
Truck and Bus	6,446	8,109	133	14,688	14,627	795
1945 (total)	5,984	36,479	504	42,967	44,524	3,077
Passenger Car	1,115	25,463	222	26,800	28,200	2,214
Truck and Bus	4,869	11,016	282	16,167	16,324	863
1946 (total)	15,310	65,490	1,512	82,312	82,298	2,448
Passenger Car.	11,086	54,684	653	66,423	66,466	1,763
Truck and Bus	4,224	10,806	859	15,889	15,832	685
1947 (total)	25,056	62,871	3,256	91,183	95,550	6,949
Passenger Car.	19,644	52,857	1,608	74,109	77,295	5,444
Truck and Bus	5,412	10,014	1,648	17,074	17,755	1,505
1948 (total)	26,845	49,148	1,787	77,781	81,314	10,698
Passenger Car.	21,589	41,295	656	63,530	66,738	8,773
Truck and Bus	5,256	7,853	1,132	14,241	14,576	1,925
1949 (total)	**31,584**	**43,466**	**1,467**	**76,517**	**76,369**	**10,638**
Passenger Car.	**28,129**	**36,440**	**509**	**65,077**	**65,140**	**8,904**
Truck and Bus	**3,456**	**7,026**	**958**	**11,440**	**11,228**	**1,734**
1950 (total)	**41,349**	**56,808**	**1,430**	**99,587**	**92,754**	**3,794**
Passenger Car.	**36,678**	**47,103**	**642**	**84,423**	**78,598**	**3,050**
Truck and Bus	**4,671**	**9,705**	**788**	**15,164**	**14,156**	**743**
1951 (total)	32,145	44,782	1,684	78,611	83,450	8,773
Passenger Car.	26,729	34,356	726	61,811	65,634	6,977
Truck and Bus	5,416	10,426	957	16,800	17,816	1,796
1951:						
Dec. (total)	1,800	2,520	198	4,518	6,419	8,773
Passenger Car.	1,438	1,804	67	3,309	4,876	6,977
Truck and Bus	361	716	131	1,208	1,543	1,796
1952:						
Jan. (total)	2,140	4,243	146	6,529	7,872	10,039
Passenger Car.	1,660	3,393	57	5,109	6,265	8,070
Truck and Bus	480	850	89	1,420	1,606	1,969
Feb. (total)	2,301	3,721	163	6,184	7,463	11,370
Passenger Car.	1,806	3,062	53	4,921	5,991	9,180
Truck and Bus	495	659	110	1,264	1,472	2,190

Source: The Rubber Manufacturers Association, Inc.

Cotton, Rayon and Nylon Tire Fabrics

(Production in Thousands of Pounds)

	Cotton				Rayon and Nylon[b]		
	Tire Cord Not Woven	Cord Fabric Woven	Chafer and All Other Tire Fabrics	Total	Tire Cord Not Woven	Tire Cord And Other Tire Fabrics	Total
1948:							
Jan.-Mar.	18,546	50,251	19,391	88,188	*a*	60,569	60,569
Apr.-June	15,585	45,385	18,213	79,183	*a*	59,759	59,759
July-Sept.	29,743	45,927	*c*	75,670	*a*	63,642	63,642
Oct.-Dec.	13,321	34,424	15,879	63,624	*a*	65,258	65,258
Total	77,195	175,987	53,483	306,665	.....	249,228	249,228
1949:							
Jan.-Mar.	***d***	**33,213**	**25,395**	**56,608**	***a***	**68,296**	**68,926**
Apr.-June	**5,309**	**29,114**	**13,617**	**48 040**	***a***	**68,269**	**68,269**
July-Sept.	**1,343**	**16,620**	**11,141**	**29,104**	**15,640**	**55,969**	**71,609**
Oct.-Dec.	**180**	**17,650**	**11,886**	**29,716**	**12,967**	**58,890**	**72,857**
Total	**6,832**	**96,597**	**62,039**	**163,468**	**28,607**	**251,424**	**281,661**
1950:							
Jan.-Mar.	3,939	19,210	12,948	36,097	12,469	60,981	73,450
Apr.-June	11,077	29,498	14,071	54,646	11,510	59,966	71,476
July-Sept.	10,529	39,792	15,101	65,152	13,161	61,614	74,775
Oct.-Dec.	13,314	37,759	14,405	65,578	12,942	63,399	76,341
Total	38,859	126,259	56,525	221,473	50,082	245,960	296,476
1951:							
Jan.-Mar.	10,929	38,223	16,737	65,889	12,715	65,275	77,990
Apr.-June	12,608	42,491	17,055	72,154	11,979	61,957	73,936
July-Sept.	16,774	44,340	17,433	78,547	12,091	67,982	80,073
Oct.-Dec.	.....	.....	.....	.....	.....	.....	.....
Total	.....	.....	.....	.....	.....	.....	.....

Source: U. S. Bureau of the Census.

Notes: (a) Included with tire cord and fabrics to avoid disclosures of operations of individual mills. (b) Fuel cell fabrics are not included with rayon and nylon tire cord and fabrics. (c) Included with tire cord not woven. (d) Included with chafer and all other tire fabrics.

Automotive Inner Tubes

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1940	**22,172**	**29,070**	**972**	**52,214**	**52,237**	**7,017**
1941	**24,722**	**33,749**	**1,232**	**59,703**	**57,433**	**4,686**
1942	6,895	7,213	159	14,267	12,685	6,206
1943	6,350	12,474	189	19,014	15,014	**2,626**
1944	6,460	20,569	196	27,224	27,488	2,813
1945	5,988	33,906	411	40,304	41,742	3,627
1946	15,327	59,357	1,424	76,108	77,251	3,820
1947	25,046	46,560	2,483	74,088	79,181	8,059
1948	26,833	40,548	1,119	68,499	70,033	9,641
1949	31,521	31,450	887	63,858	65,114	10,657
1950	41,240	42,671	811	84,723	80,179	.....
1951	32,167	32,480	1,063	65,711	67,427	10,115
1951:						
Dec.	1,803	1,637	123	3,563	5,149	10,116
1952:						
Jan.	2,144	3,232	99	5,475	5,582	10,343
Feb.	2,289	2,551	119	4,958	5,138	10,507

Source: The Rubber Manufacturers Association, Inc.

Smoked Sheets–Spot Closing Prices

(New York Market—Cents per Pound)

Year	High	Low	Avg.	Year	High	Low	Avg.
1910	288	141	206.60	1931	8½	4¼	6.17
1911	184	114	141.30	1932	4¾	2½	3.49
1912	140	108	121.60	1933	9⅞	2⅜	5.96
1913	113	59	82.04	1934	15⅞	8¾	12.92
1914	93	56	65.33	1935	13¾	10½	12.37
1915	79	58½	65.85	1936	23	13½	16.41
1916	102	55	72.50	1937	26⅞	14	19.39
1917	90	52	72.23	1938	17⅞	10¼	14.64
1918	70	40	60.15	1939	24	14⅜	17.57
1919	57	38½	48.70	1940	24	18¼	20.10
1920	56½	16	36.30	1941	24⅞	19⅛	22.40
1921	21¾	11½	16.36	1942	22½	22½	22.50
1922	**28¾**	**13⅝**	**17.50**	1943	22½	22½	22.50
1923	**37⅛**	**24¾**	**29.45**	1944	22½	22½	22.50
1924	**40⅞**	**17⅜**	**26.20**	1945	22½	22½	22.50
1925	121	34⅜	72.46	1946	22½	22½	22.50
1926	**88½**	**36¾**	**48.50**	1947	25	14	20.00
1927	**41⅜**	**33**	**37.72**	1948	25	18	21.99
1928	**41¼**	**17**	**22.48**	1949	19¾	15⅞	17.57
1929	**26⅜**	**15½**	**20.55**	1950	86	18	**41.10**
1930	**16½**	**7½**	**11.98**	1951	76	52	*(a)*

Note: Price was fixed by Government on August 6, 1941, at 22½c a pound for non-war uses. Free trading was resumed May 1, 1947. (a) Free trading suspended March 31, 1951. GSA selling price ranged between 52 and 66c during balance of year.

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market—in Cents)

Average Monthly Price Per Pound

	1945	1946	1947	1948	1949	1950	1951	1952
Jan.	22.36	25.49	32.58	36.09	33.37	31.89	45.04	42.96
Feb.	22.29	26.57	33.91	33.63	33.41	32.79	(a)	41.64
Mar.	22.43	27.52	35.89	35.04	33.44	32.65	46.06	41.70
Apr.	21.88	28.40	35.89	38.10	33.84	33.23	46.06	41.79
May	23.30	28.17	36.51	38.57	33.73	33.64	46.06	.....
June	23.42	29.89	37.83	38.12	33.56	34.61	46.06	.....
July	23.27	34.11	38.03	34.89	32.99	38.11	41.21	.....
Aug.	23.10	36.31	34.83	32.23	32.06	38.93	35.93	.....
Sept.	23.25	37.59	32.21	31.92	30.94	41.62	36.20	.....
Oct.	23.85	36.79	32.39	32.01	30.32	42.66	38.13	.....
Nov.	24.71	31.50	34.50	32.15	30.52	43.11	42.70	.....
Dec.	25.21	33.03	36.74	32.90	31.08	43.37	43.32	.....
Average for Year	23.25	31.28	35.11	34.64	32.44	37.05	42.43	....

Note: The Government established a ceiling price of 45.76c for spot cotton on March 3, 1951. (a) Trading suspended during February.

Consumption of Vinyl Resins

(In Thousands of Pounds)

	Sheeting and Film[a]	Textile and Paper Coating Resins	Molding and Extrusion Materials	All Other
1948	98,021	31,085	73,598	21,147
1949	157,544	29,470	81,842	19,792
1950	227,149	46,044	113,889	21,868
1951	161,547	43,688	134,890	23,934
1951:				
Nov.	12,523	3,203	10,453	2,302
Dec.	11,097	2,597	9,403	1,967
1952:				
Jan.	13,125	3,031	11,772	2,776

Source: U. S. Tariff Commission.

Note: (a) Includes weight of fillers, plasticizers, extenders and safety glass sheeting. Beginning January, 1951, statistics are listed on a resin content basis.

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Rubber Industry Employment, Wages and Hours

All Rubber Products

	1951				1952			
Mo.	Production Workers (thousands)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Production Workers (thousands)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings
Jan.	222	$66.78	40.4	$1.653	219	$74.76	41.1	$1.819
Feb.	222	63.37	38.9	1.629	216	....	....	....
Mar.	220	65.88	40.0	1.647	....	....	....	....
Apr.	219	65.96	40.0	1.649	....	....	....	....
May	220	68.56	41.3	1.660	....	....	....	....
June	220	71.27	41.9	1.701	....	....	....	....
July	217	70.81	41.0	1.727	....	....	....	....
Aug.	218	69.52	40.7	1.708	....	....	....	....
Sept.	218	70.18	40.9	1.716	....	....	....	....
Oct.	215	68.67	40.3	1.704	....	....	....	....
Nov.	219	69.46	40.5	1.715	....	....	....	....
Dec.	219	73.49	41.1	1.788	....	....	....	....

Tires and Tubes

Jan.	91.3	73.69	38.4	1.919	95.7	87.87	41.1	2.138
Feb.	90.6	66.95	35.5	1.886	....	....	....	....
Mar.	88.3	71.40	37.6	1.899	....	....	....	....
Apr.	87.4	70.15	37.0	1.896	....	....	....	....
May	88.3	75.92	39.4	1.927	....	....	....	....
June	89.9	82.44	41.7	1.977	....	....	....	....
July	90.0	83.67	41.4	2.021	....	....	....	....
Aug.	91.5	82.07	41.2	1.992	....	....	....	....
Sept.	92.4	81.64	40.9	1.996	....	....	....	....
Oct.	89.8	78.76	39.9	1.974	....	....	....	....
Nov.	94.8	80.27	40.5	1.982	....	....	....	....
Dec.	95.6	85.44	40.8	2.094	....	....	....	....

Rubber Footwear

Jan.	24.9	57.53	41.6	1.383	25.4	60.39	40.1	1.506
Feb.	25.3	55.87	40.6	1.376	....	....	....	....
Mar.	25.0	58.17	41.4	1.405	....	....	....	....
Apr.	24.8	59.82	42.1	1.421	....	....	....	....
May	25.4	61.48	42.9	1.433	....	....	....	....
June	25.7	59.98	42.3	1.418	....	....	....	....
July	24.8	54.68	39.0	1.402	....	....	....	....
Aug.	25.2	57.04	40.8	1.398	....	....	....	....
Sept.	25.3	55.94	40.1	1.395	....	....	....	....
Oct.	25.5	56.76	40.0	1.404	....	....	....	....
Nov.	25.6	56.64	40.2	1.409	....	....	....	....
Dec.	25.5	59.95	40.7	1.473	....	....	....	....

All Other Rubber Products

Jan.	105.8	63.06	41.9	1.505	97.7	65.58	41.3	1.588
Feb.	106.3	61.95	41.3	1.500	....	....	....	....
Mar.	106.3	63.13	41.7	1.514	....	....	....	....
Apr.	106.3	63.81	41.9	1.523	....	....	....	....
May	106.0	64.09	42.5	1.508	....	....	....	....
June	104.7	64.47	42.0	1.535	....	....	....	....
July	102.2	63.29	41.1	1.540	....	....	....	....
Aug.	101.2	61.42	40.3	1.524	....	....	....	....
Sept.	100.2	63.06	41.0	1.538	....	....	....	....
Oct.	99.4	62.68	40.7	1.540	....	....	....	....
Nov.	98.2	62.36	40.6	1.536	....	....	....	....
Dec.	97.9	65.52	41.6	1.575	....	....	....	....

Source: U. S. Department of Commerce and Labor.

Note: Data are based upon reports from cooperating establishments covering both full and part-time employees who worked during or received pay for the pay period ending nearest the 15th of the month. The employment series have been adjusted to levels indicated by Federal Security Agency data for 1947, and have been carried forward from 1947 bench-mark levels, thereby providing consistent series. Hours and earning data pertain only to production and related workers.

Production Index for the Rubber Industry

Production 1935-1939 = 100

(Based on man-hours)

	1950	1951	1952		1950	1951	1952
Jan.	194	244	250	July	222	243	....
Feb.	195	235	245	Aug.	236	243	....
Mar.	197	239	....	Sept.	244	245	....
Apr.	203	238	....	Oct.	250	239	....
May	213	247	....	Nov.	250	245	....
June	221	251	....	Dec.	251	250	....

Source: U. S. Department of Commerce.

Sales by the Rubber Industry

(In Millions of Dollars)

	1950	1951	1952		1950	1951	1952
Jan.	265	454	468	July	454	438	....
Feb.	273	434	....	Aug.	457	467	....
Mar.	293	459	....	Sept.	404	435	....
Apr.	288	439	....	Oct.	405	445	....
May	321	432	....	Nov.	397	438	....
June	350	433	....	Dec.	424	363	....

Source: U. S. Department of Commerce.

Rubber Manufacturers' Inventories

(Based upon Book-Value)

(In Millions of Dollars)

	1950	1951	1952		1950	1951	1952
Jan.	524	562	797	July	501	616	....
Feb.	526	555	....	Aug.	483	640	....
Mar.	532	554	....	Sept.	502	659	....
Apr.	536	565	....	Oct.	524	705	....
May	540	583	....	Nov.	564	739	....
June	544	610	....	Dec.	549	799	....

Source: U. S. Department of Commerce.

Various Compounding Materials Consumed by the Rubber Industry

Material	1944	1945	1946	1947	1948	1949	1950
Antimony, Primary:							
Short tons	.....	.....	.....	39	41	55	.....
% of total	.....	.....	.....	.002	.003	.005	.....
Asphalt [a]							
Short tons	20,189	19,483	28,715	32,113	19,967	18,050	26,819
% of total	.006	.005	.007	.007	.004	.003	.003
Barite (Barytes):							
Short tons	10,000	10,000	20,000	17,000	18,000	14,000	....
% of total	2.9	2.1	4.4	3.1	2.85	2.53	.....
Carbon Black:							
Short tons	369,015	402,193	470,732	471,790	435,282	383,565	515,184
% of total	94.6	95.5	95.3	94.3	95.5	93.3	92.9
Clay, Kaolin:							
Short tons	59,588	109,936	162,393	166,201	176,965	197,341	263,306
% of total	6.8	11.7	12.3	11.5	11.3	13.1	15.0
Clay, Fire & Stoneware:							
Short tons	7,160	7,800	12,951	17,970	15,480	.....	.....
% of total	0.1	0.1	0.2	0.2	0.2	.....	.....
Lime:							
Short tons	5,634	7,170	3,193	589	1,154	715	908
% of total	0.09	0.12	0.05	0.01	0.02	.0002	.0002
Litharge:							
Short tons	3,023	1,864	2,131	2,205	2,835	.....	.....
% of total	2.2	1.3	1.6	1.3	1.8	.....	.....
Lithopone:							
Short tons	726	977	1,607	3,085	4,192	3,245	.....
% of total	0.5	0.7	1.1	1.9	3.0	4.1	.....
Mica, Ground:							
Short tons	1,137	3,715	4,951	3,900	4,372	3,856	.....
% of total	2.2	7.1	8.0	6.0	7.0	7.0	.....
Sulfur:							
Short tons	63,000	64,960	72,800	72,800	70,560	59,360	.....
% of total	1.9	2.0	2.2	1.8	1.7	1.5	.....
Talc [b]							
Short tons	51,833	63,758*	65,980	71,840	66,226	53,414	.....
% of total	13.0	16.0	14.4	13.9	13.0	.12	.....
Zinc Oxide:							
Short tons	59,518	63,447	83,776	82,248	82,895	58,496	82,944
% of total	42.3	49.6	53.1	51.2	54.9	52.5	51.6

Source: U. S. Bureau of Mines.

Notes: (a) Solid and semi-solid products of less than 200 penetration. (b) Includes prophyllite and ground soapstone. * Revised.

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GRADUATE CHEMIST: B.S. Chemistry. Have worked in laboratory, production, control and as general manager. Experience consists of the following: Protective coatings—rubber, lacquer and vinyls. Shoe adhesives—flocking—extrusion—synthetic leather—mildew proofing—flame and waterproofing—saturating—combining—sponge latex—rubber footwear, all types—some latex. Address Box 368-P, RUBBER AGE.

TECHNICAL SALES position desired by rubber chemist with wide experience in development, compounding, raw material research, handling of factory problems, etc. Good personality and appearance. Ph.D.—Midwest preferred. Address Box 369-P, RUBBER AGE.

Chemist, 32, desires PART-TIME technical or sales connection in New York City area. Broad industrial background in natural and synthetic latex, rubber, synthetic adhesives, industrial coatings, lacquers, vinyls, allied compounding materials. Address Box 360-P, RUBBER AGE.

PRACTICAL MAN capable of taking charge of small plant. Versed in compounding, production, maintenance and buying. Factory superintendent of custom molding plant for past eight years. Midwestern or Western connections preferred, but will consider other locations. Married. Address Box 373-P, RUBBER AGE.

PRODUCTION MANAGER or GENERAL MANAGER: Man with over twenty years experience in production, management, testing and compounding natural and synthetic rubber for specification molded goods and mechanicals. Recent experience high temperature high speed molding. Practical, energetic, possesses initiative organizational ability, can handle personnel. Proven record of performance. Address Box 379-P, RUBBER AGE.

CHEMIST-SUPERINTENDENT: Over twenty years experience production, management, testing and compounding natural and synthetic rubber for molded goods and mechanicals—experienced high temperature high speed curing. Can cut your material and manufacturing costs. Available in consulting capacity. Address Box 380-P, RUBBER AGE.

LATEX CHEMIST: B.S., desires responsible position in New York area. Six years experience in laboratory and factory technics including the design, development, and trouble-shooting on compounds for dipping, casting, adhesives, coatings and foam. Address Box 381-P, RUBBER AGE.

SALES CONSULTANT, Market Research or Commission Technical Sales: Experienced and successful owner of own company in Mid-West, representing major manufacturers and suppliers to the chemical, rubber, paint, resin and fabricating industries, with successful technical background in these fields, wishes to contact with responsible organizations in, or in respect to, California. Very wide experience, master's degree, recommendations from nationally known executives. Address Box 390-P, RUBBER AGE.

PRODUCTION MINDED Rubber and Plastics Chemist, Chem. Engineer, Compounder. Eight years research, development, production, quality control, technical service, supervision, technical director. Mechanical goods, molded and extruded, natural and synthetic, emphasis oil and solvent resistant stocks and coatings. Compounding to ASTM, military and automotive specifications and special customer requirements. Phi Beta Kappa, 33, married, child, veteran, draft-exempt. Address Box 394-P, RUBBER AGE.

If you can use a top grade PRODUCTION SUPERVISOR and LATEX COMPOUNDER with an excellent record, send for resume to Box 395-P, RUBBER AGE.

POSITIONS WANTED (Continued)

V-BELT DEVELOPMENT ENGINEER, with eight years experience in belt development, graduate chemical engineer. Address Box 396-P, RUBBER AGE.

LATEX CHEMIST: Dip plant manager for eleven years, special interest in latex research and development work. Address Box 398-P, RUBBER AGE.

RUBBER CHEMIST, eleven years. Experienced dry rubber, reclaim, plastisol. Expert in latex. Supervisory or compounding. New Jersey-New York area. Address Box 399-P, RUBBER AGE.

EXECUTIVE-RUBBER ENGINEER, desires to relocate, capable as factory manager or technical director. Over twenty years technical-practical experience manufacturing mechanical rubber and sponge rubber products. Experienced in all phases of the processes. Job contracts considered. Address Box 401-P, RUBBER AGE.

RUBBER CHEMIST, FOREMAN, SUPERINTENDENT: Good experience in footwear, sponge, small molded mechanicals, production, research, plant control. Presently employed, wishes to make change. Prefer mechanicals or sponge. Address Box 402-P, RUBBER AGE.

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FACTORY M'GR., heavy exp. mgm't; personnel of approx. 900. Hose, moldings, reclaiming ..... To $15,000
ASS'T to V.P. (charge mf'r) molded, extruded, and mech'l $12,000

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Excellent opportunity for research, development and technical service in the utilization of reinforcing fillers, resins and other compounding ingredients. Must have considerable experience in tire manufacture. Old established manufacturer, modern research facilities, excellent working conditions. Salary open. Write, giving academic, personal and work history.

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RUBBER CHEMIST, to take charge of laboratory, compounding and development in medium sized factory in New England manufacturing rubberized fabrics, thread and adhesives. Excellent opportunity and permanent position. State experience, age and salary requirements in reply. Address Box 382-W, RUBBER AGE.

RUBBER CHEMICALS RESEARCH CHEMIST: Unusual opportunity for organic or physical chemist with experience in rubber technology for original research on application of chemicals in natural and synthetic elastomers; additional experience in polymerization desirable. Qualifications: strong background in organic and/or physical chemistry, rubber compounding experience (including knowledge of evaluation methods), ability to organize and supervise research of others in group, ability to handle outside research contacts. Location: Organic Chemicals Division Research Department, Nitro, West Virginia (Charleston). New laboratory. Submit resume of background and experience to: Personnel Department, MONSANTO CHEMICAL COMPANY, 1767 South Second Street, St. Louis 4, Missouri.

ADHESIVES CHEMIST: To work exclusively in research and development of adhesives in laboratory of progressive Midwest compounding company. Experience in natural and various latices required. Ability to work independently of prime importance. Reply in confidence giving details of academic and professional experience, salary range desired and age. Address Box 383-W, RUBBER AGE.

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RUBBER TECHNICIAN

North Carolina branch plant of a nationally known concern has opening in technical department for a chemical engineer with three to five years experience in development and manufacture of mechanical goods. Must know compounding and factory processing. Work involves responsibility for quality control and comprehensive reporting of laboratory results. Good opportunity for progress upon demonstration of ability. Excellent living conditions. Outline personal history, education and experience. Indicate salary required. Address Box 385-W, RUBBER AGE.

PLASTIC-RUBBER CHEMIST: College graduate having three to five years experience with electrical insulation materials for wire and cable in a control laboratory or dielectric research laboratory; for work on the development of experimental thermo-plastic and thermo-setting compounds and their application to electrical conductors. Apply direct to: L. W. Eastwood, Assistant Director, KAISER ALUMINUM & CHEMICAL CORPORATION, Division of Metallurgical Research, P. O. Box 1451, Spokane 10, Washington.

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RUBBER CHEMIST with broad knowledge of specification work wanted by Los Angeles concern. Must be capable of developing new formulations and to take charge of laboratory for a progressive and well-established manufacturer. State experience, technical background, expected salary. Address Box 387-W, RUBBER AGE.

J. W. Jenkins Co.
2158 Front St., Cuyahoga Falls, Ohio (Akron)
CRUDE RUBBER — PLASTICS — CHEMICALS

HELP WANTED (Continued)

CHEMIST: Experienced in sponge rubber research and production. Responsible position with well established medium sized company in Midwest. Give personal history, education and experience, also salary. Replies held confidential. Address Box 389-W, RUBBER AGE.

PRODUCTION CHEMIST, with laboratory and factory experience on molded, solid and sponge rubber industrial parts. Send resume. Our technical staff know of this ad. Good salary and opportunity. Address Box 392-W, RUBBER AGE.

CHEMIST to head new chemical production control department. Experience in rubber compounding essential. Evaluation of production rubber insulating compounds, magnet wire insulation and production control. Excellent opportunity for aggressive chemist. Contact THE ELECTRIC AUTO-LITE COMPANY, Wire and Cable Division, Port Huron, Michigan, for appointment advising salary requirements.

RUBBERIZED PONTONS AND BOATS
ENGINEER AND PRODUCTION SUPERVISOR WANTED
Experienced man required.
Address Box 393-W, RUBBER AGE

ADHESIVE CHEMIST on consulting basis for Eastern adhesive tape plant. Experienced chemist to formulate crude, reclaim or synthetic pressure sensitive adhesive for cloth tapes on spreader machine. Submit complete resume of past experience in first letter. Replies held strictly confidential. Address Box 397-W, RUBBER AGE.

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FOR SALE: Quantity sheet rubber, white, 97 pure gum, 1/64 thickness, 18 in. wide, 20 to 75 yard rolls, 25c a yard. Samples on request. Address: TOM-TOM COMPANY, P. O. Box 1007, Hollywood, California.

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We do milling and compounding of all types —blacks or colors—Master Batches. All mixing done under careful supervision and laboratory control.
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Complete rubber plants.
Also individual items such as: 2-roll mills, calenders, mixers and Banbury Mixers.
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WANTED: Used spreader or steam can. Approx. 72" wide. Address Box 408-E, RUBBER AGE.

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6 x 12" new lab

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18 x 45"
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6 x 12" new lab
Crackers and Refiners, all sizes

MISCELLANEOUS
Black Rock 4M stock cutters
48X Black Rock washer cutters

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All sizes from 1" to 12"

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All diameters, lengths and working pressures

MISCELLANEOUS
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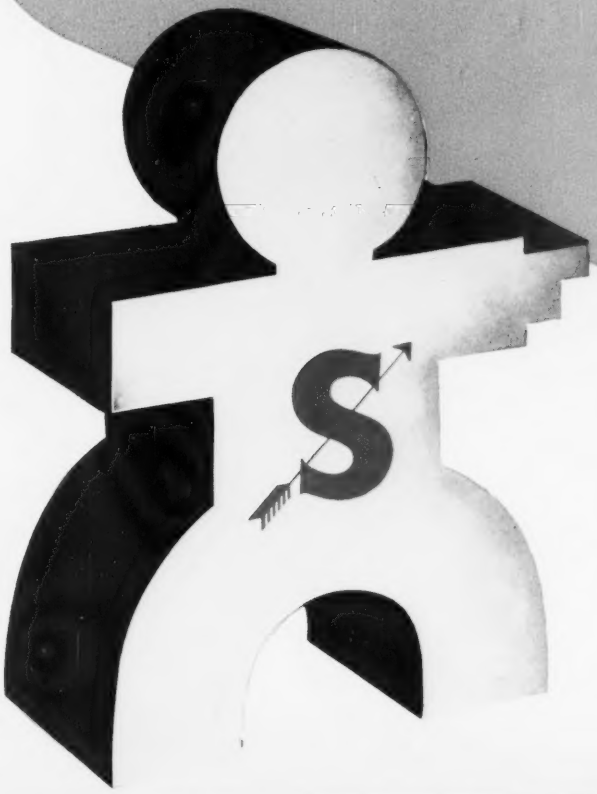

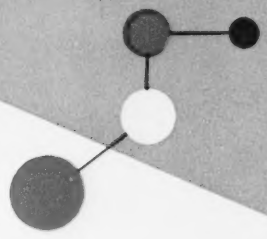

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